THE PALESTINE EXPLORATION FUND

NOTES AND NEWS.

THE packet of papers and plans mentioned in the July *Quarterly Statement* as having been received from Herr Schumacher has been placed in the hands of the printers and engravers. The text has been carefully revised by Mr. Guy Le Strange, not in order to add anything to it or to subtract anything, but in order to anglicise a manuscript written in German-English. The volume is not yet quite ready, but may be expected in a few days. One copy will be forwarded to every subscriber who has already signified, or who will on the receipt of this *Quarterly Statement* signify his desire to possess it. It will be sent, post free, in order of application. A closer examination of Herr Schumacher's map and of his manuscript, together with an urgent request from the author, has made it necessary to change the title originally proposed. It will not be called "The Land of Jaulan," because that title, it is now perceived, would convey an incorrect impression of its contents, but "Across the Jordan," with a sub-title explaining that it is a record of exploration in parts of the Hauran and the Jaulan.

As regards the map, it should be mentioned that Herr Schumacher executed at the same time another survey of a district of equal extent to that done for us. This map, lying north of our portion, he has sent to the German Society for the Exploration of Palestine.

These explorations were made possible to Herr Schumacher by a permission to survey for a proposed railway, the observations, notes, drawings, and memoirs being executed during the course of his work. The triangulation has been found by Mr. Armstrong to fit very well with that of our own Surveys, and there has been no difficulty in laying down the map upon our sheets. A reduced map will be issued with the volume. The number of plans and drawings which illustrate the volume amount to nearly a hundred and fifty. With the volume will be reprinted Mr. Oliphant's and Mr. Guy Le Strange's papers on the country east of Jordan.

The Committee earnestly desire to draw attention to the very important Circular which has just been prepared and issued. It will be perceived that an opportunity is here presented for doing on a large and exhaustive scale what has hitherto hardly been attempted at all, namely, the collection of modern Syrian customs, usages, traditions, languages, legends, and manners. It is an inquiry

which will without doubt prove fruitful in Biblical illustration; the value of the results will depend entirely on the character of the question proposed; and it is *most earnestly hoped that every one interested in the subject*, and able to assist, will help the Committee to make this inquiry thoroughly comprehensive, and, with that view, will forward suggestions for questions. These should embrace everything, however apparently trivial, which concerns daily life, religion, tradition, arts, industries, and customs. A sub-committee will receive and arrange them under their various headings, and a beginning will be made as soon as possible. The results, if the Committee receive the support which they anticipate in this most important undertaking, should be to pour light upon many points which are at present obscure. Th expense of the work will not, it is anticipated, be very great. On this branch of inquiry, as of the Survey, it may be most truly said that the old things are fast passing away, and that if they are not very soon collected and published they may be forgotten and hopelessly lost. The following is the Circular:—

"The Committee have long had under consideration the collection of all that has to do with the manners and customs of the present inhabitants of Palestine and other parts of Syria. Attempts have been made from time to time, by residents of the country, to do this, especially by M. Clermont-Ganneau, the Rev. A. Klein, the Rev. James Niel, Mrs. Finn, Miss Rogers, and the officers of the Survey. These attempts have been necessarily incomplete, and have done little more than indicate the extent and depth of the treasures which lie hidden among the peasantry of these lands.

"Before a serious attempt could be made to carry out this inquiry successfully, it was necessary first to find an organised machinery of agents, who should be directed by some competent persons in the country, under the Committee at home. It was next necessary that these agents should speak the language of the natives perfectly, so as to note differences and peculiarities of idiom; that they should be able to command their confidence, so that the women would converse with them and answer their questions; and that they should be persons of trained intelligence, who would know the questions that should be asked and the reasons for asking them.

"This machinery, with a large body of agents highly educated and intelligent, has now been placed at the disposition of the Committee.

"It remains, therefore, to draw up questions which these agents will be invited to ask.

"It will be possible to extend the inquiry simultaneously over the whole of the land covered by the Bible. That is to say, we may carry on our inquiry at the same time over Syria, Egypt, Cyprus, Asia Minor, the Hauran, the Valley of the Euphrates, and Armenia. It is, therefore, desirable to draw up the questions with as much fulness and covering as wide an area as possible.

"The subject divides itself into the following branches:—

1. Religion and Morals.
2. Land Tenure, the Village Commune, &c.
3. Archæology.
4. Ethnology.
5. Health and Disease.
6. Superstitions.

7. Legends and Traditions.
8. Language.
9. Agriculture, including Botany, &c.
10. The Daily Life.
11. Industries.
12. Arts and Architecture.
13. Amusements and Sports.
14. Birth and Marriage, Death and Burial Laws and Customs.
15. Usages still surviving, which illustrate the Bible.
16. Traces of the successive occupants of the Holy Land.
17. Modern and ancient Literature.
18. Proverbs.
19. Science.
20. Music.
21. Natural History.
22. Peculiar manners and customs not included under any of the above headings.

"The Committee, in the work of drawing up these questions, have resolved upon asking the assistance of the following scholars and Societies:—

1. The Companies of Revision of the Old and New Testament.
2. The contributors to Smith's and Kitto's Bible Dictionaries.
3. The British and Foreign Bible Society.
4. The Scottish National Bible Society.
5. The American Bible Society.
6. The Trinitarian Bible Society.
7. The Missionary Societies.
8. Zion College.
9. The Society of Biblical Archæology.
10. The Royal Geographical Society.
11. The Society of Antiquaries.
12. The Archæological Institute and the Archæological Association.
13. The President of the late American Society for the Exploration of Palestine.
14. The Universities of Great Britain and Ireland and the Colonies.
15. The Heads of Departments in the British Museum.
16. The Department of Science and Art, South Kensington.
17. The Royal Institute of Architects.
18. The Anthropological Institute.
19. The College of Physicians and the College of Surgeons.
20. The Folk Lore Society.
21. The Cambridge Philological Society.
22. The Royal Agricultural Society.
23. The Royal Horticultural Society.

"To these will be added the Archbishops and Bishops of the Church of England, those of the Episcopal Church in Scotland and Ireland, the Colonies and the United States, the Presidents of the Established Church of Scotland the Free Church, and the United Presbyterians, the Presidents of the Wesleyan, Congregational, Baptist, and other Nonconformist bodies in Great Britain, Ireland, the Colonies, and the United States, and the Chief Rabbi of Great

Britain, and, lastly, all scholars, archæologists, and Biblical students who may be willing and able to render assistance and advice, with other societies, colleges, and institutions not included in the above which may also be usefully approached.

"We have, therefore, in communicating to you this preliminary announcement, to ask for your assistance and co-operation. We have also to call your attention to the magnitude of the enterprise, and to its great importance, whether considered from a Biblical or from any other point of view.

"We enclose a specimen page of questions. A form will be immediately prepared, and will be forwarded to you on application, and a sub-committee will be appointed for receiving, arranging, and finally preparing the questions.

W. Ebor, *President.*
James Glaisher, F.R.S., *Chairman of the Executive Committee.*
Walter Morrison, *Treasurer.*
Walter Besant, *Secretary.*"

Dr. Selah Merrill writes, on September 2nd :—

"The open space in front of the Mediterranean Hotel and the Barracks, or Castle, has been dug over during the past summer for the purpose of repaving the street, and some very interesting remains have been brought to light. The most interesting of all, however, is what I consider to be the actual remains of the second wall found between Duisburg's Store (formerly Spittler's) and the Jaffa Gate, at a depth of 15 feet below the surface of the ground; the stones are similar to the large bevelled stones in the Castle opposite. I will send you a plan of these ruins in a few days, perhaps by the next mail."

New editions of "Tent work in Palestine" and "Heth and Moab," Captain Conder's popular works, have been issued at 6*s.* each. Professor Hull's "Mount Seir" is also now ready at the same price.

Professor Hull's scientific Memoir on the Geology of Palestine is now in the press, and will be shortly issued. It will be uniform with the "Survey of Western Palestine."

Mr. H. Chichester Hart's Memoir on the Flora and Fauna of the Wâdy Arabah will also be issued as soon as possible in the same form and size.

A paper by the Rev. W. F. Birch on Acra has been unavoidably kept back until January.

As regards the copies which remain of the "Survey of Western Palestine," the friends of the Society are urged to get them placed in public libraries. The work will not be reprinted, and will never be sold by the Committee at a lower price; and as it becomes known, for the *only* scientific account of Western Palestine, it will certainly acquire a yearly increasing value. Five hundred were printed, and the type is now distributed.

The Palestine Pilgrims' Text Society has now in hand—(1) A translation of Procopius, that is to say, such parts as concern the buildings of Justinian. This has been annotated by Professor Hayter Lewis. It will also be illustrated by numerous drawings. (2) The Bordeaux Pilgrim, which is receiving notes from Sir Charles Wilson. (3) The Pilgrimage of the Abbot Daniel, which is translated and ready for the press. (4) The Travels of an early Persian Pilgrim, translated by Mr. Guy Le Strange.

The income of the Society, from June 17th to September 21st inclusive, was —from subscriptions and donations £168 12*s.*, from all sources £247 5*s.* 5*d.*, The expenditure during the same period was £498 12*s.* 10*d.* On October 1st the balance in the Banks was £167 16*s.* 7*d.*

It is suggested to subscribers that the safest and most convenient manner of paying subscriptions is through a Bank. Many subscribers have adopted this method, which removes the danger of loss or miscarriage, and renders unnecessary the acknowledgment by official receipt and letter.

Subscribers who do not receive the *Quarterly Statement* regularly, are asked to send a note to the Secretary. Great care is taken to forward each number to all who are entitled to receive it, but changes of address and other causes give rise occasionally to omissions.

While desiring to give every publicity to proposed identifications and other theories advanced by officers of the Fund and contributors to the pages of the *Quarterly Statement*, the Committee wish it to be distinctly understood that by publishing them in the *Quarterly Statement* they neither sanction nor adopt them.

The only authorised lecturers for the Society are—

(1) The Rev. Henry Geary, Vicar of St. Thomas's, Portman Square. His lectures are on the following subjects :—
The Survey of Western Palestine, as illustrating Bible History.
Palestine East of the Jordan.
The Jerusalem Excavations.
A Restoration of Ancient Jerusalem. Illustrated by original photographs shown as "dissolving views."

(2) The Rev. James King, Vicar of St. Mary's, Berwick. His subjects are as follows :—
The Survey of Western Palestine.
Jerusalem.
The Hittites.
The Moabite Stone and other monuments.

(3) The Rev. James Neil, formerly Incumbent of Christ Church, Jerusalem.

(4) The Rev. George St. Clair, formerly Lecturer to the Society, is about to organise, by arrangement with the Committee, a course of lectures this winter on the work of the Society.

PROFESSOR SOCIN ON THE SURVEY OF WESTERN PALESTINE.

In the October number of the *Expositor*, Professor Socin, of Tübingen, contributes a paper called a "Critical Estimate of the Work of the Palestine Exploration Fund." It is not customary with us to reply to criticisms on our work, and in this case we should have refrained from comment on Professor Socin's remarks, except for the fact that certain observations of his, made in the most excellent spirit and with the best intentions, will, if not noted and answered, mislead his readers and our supporters. Professor Socin begins and ends his paper with a most courteous and friendly acknowledgment of the importance of the Society's work. "The Memoirs," he says, "by reason of the new material which they afford, will continue for decades to be the standard work from which Palestine research must set out."

Professor Socin's remarks deal first with the accuracy of the map; next with the Name Lists; thirdly, with Canon Tristram; fourthly, with Captain Conder; and lastly, with what he calls the Results of the Survey. He also touches on the discussions carried on in the *Quarterly Statement*.

(1.) As regards the accuracy of the map. It does not appear, when Professor Socin compares our map with that of M. Guérin, as if he exactly understands the main difference between our map and all other maps of Palestine. Ours is surveyed by triangulation; all others are constructed by some system of "dead reckoning." Now a triangulation is subject to an almost infallible test of accuracy. It is this. At the outset a base line is measured; at any part of the triangulation it is possible to measure by chain any of the lines the lengths of which have been obtained by calculation. The actual measured length should correspond with the calculated length. This has been done by our surveyors, and with most satisfactory results. As a matter of fact M. Guérin's book, which contains a few details not noted by our officers, does not contain one-half the number of names and places; while his map cannot pretend to scientific accuracy as to position, and as to watercourses, hills, and streams it is, and must be, practically useless. It is, in fact, impossible that one man working alone, and without scientific method, should produce a map in any way comparable to that surveyed by Royal Engineers.

(2.) Next as to the Name Lists. Professor Socin states that the "members of the Survey, who manifestly were not Arabic scholars, repeated the names which they had gathered to the scribe Kassatly, instead of his collecting them from the lips of the guides and natives." This is not by any means a correct way of describing the method followed, which was as follows:—The surveyors, in the course of their day's work, collected and wrote down in their own way—the guide being present—the names which they got from the natives. In the evening, on their return, each of them handed in to Captain Conder the day's list, which was gone through by Kassatly, *with the native guide*, and written down by him, or by Captain Conder at his dictation. The surveyors, therefore, had nothing to do

with the spelling of the names, for which Kassatly and the guides are responsible.

Next, as regards the list of the common place appellatives, which, according to Professor Socin, "must have been drawn up by one who had no knowledge of Arabic grammar." It was *drawn up by Professor Palmer himself.* It must, however, be understood that he set down, as was done in the map, not the literary Arabic at all, which was not wanted, but the fellahîn Arabic. Thus, to take in order each one of the cases mentioned by Professor Socin. It is true that the plural of "Bâb" is not "buwâb;" it is "bawwâb." But the natives of Palestine, like the English, are not good at the double consonant. They do not say "bawwâb," but "buwâb." So also of the plural of *birkeh:* they do not say *burak*, but *burâk*, and the popular plural of *tell* is, as stated in the list, *tellûl.* The ending *eh* is also given on the map as it was pronounced, which accounts for an occasional variation. And as regards the word *Sh'aîb*, it is written, as nearly as possible, as pronounced. The literary way would have been to write it Shŭ'aib, but in common speech the vowels at the beginning of a word are generally slurred over. The surveyors, in fact, set down the names as the people pronounce them. Thus, to take the last of Professor Socin's instances, *Khurbeh*, or *Khurbet*, the literary name would be, *e.g.*, *Khurbetu Ainab*, which in the vulgar speech becomes Khurbet Ainab, and when the word is used by itself simply *Khurbeh*, and as a rough rule for travellers who are not Arabic scholars it is quite correct to say that *Khurbeh* in Palestine becomes *Khurbet* before a vowel.

A corresponding example has been suggested to me. On the Ordnance Survey of Oxfordshire will be found a place called *Shotover.* It is so set down because the people call it *Shotover.* Its original name is supposed to have been *Chateau vert.* Yet surely the surveyors were right in setting down the popular name. Again, on Dartmoor is a mountain called on the Survey maps *Hamilton Down.* The people call it Hamildon, or Hamilton, and so misled the surveyors, because its real name is Hamil dun, *i.e.*, I believe, the Black Down.

As regards Professor Socin's strictures on the etymologies proposed by Professor Palmer, the identifications proposed by Captain Conder or M. Ganneau, the Hebrew and Arabic of Canon Tristram, or the Tribe boundaries laid down by Mr. Trelawney Saunders, we have nothing at all to say. These gentlemen are, with one exception, quite able to defend themselves against any attacks which may be made on them. As regards that one exception, Professor Palmer's etymologies are on record, as his opinion, and will stand or fall as they are right or wrong, and as the common speech of the Syrian natives becomes better known. In his lifetime there was no better authority on the modern Syrian dialects. Professor Socin, however, raises one other point which commands attention from us. It has been the custom of the Committee to open the pages of its Journal to the free discussion of all points connected with the topography of the Holy Land, routes, itineraries, &c., connected with its history. The Journal has become the recognised—almost the only—organ

for the discussion of these points. It therefore happens that a great many pages may be devoted to the site, say, of Emmaus. This practice, Professor Socin points out, may lead to the general adoption of a wrong theory, or at all events of sites and routes which do not commend themselves to many scholars and students. This may possibly happen. But the best way to prevent it from happening is for every opinion to be represented. The *Quarterly Statement* is read by Palestine students over the whole world. If this is borne in mind by Professor Socin, he may himself perhaps be minded to prevent the spread of what he considers error.

The *work* of the Society, properly so-called—all that the Committee are called upon to defend—is the mass of *facts* which it has been able to amass and is still amassing. A practically impregnable map, for instance; an immense Name List, which may be added to and even revised: great discoveries in Jerusalem and elsewhere: a Geological Survey, not yet published: thousands of ruins sketched and surveyed,—this constitutes the work that has been done. But theories, etymologies, illustrations, tribe boundaries, and speculation generally do not constitute the work of the Society, and must not be criticised under that name. W. B.

NEW DISCOVERIES IN JERUSALEM.

By Selah Merrill, D.D., LL.D.

During the past two or three months some very interesting tombs have been discovered in the western slope of the hill above Jeremiah's Grotto. As these appear to have direct connection with the church in that vicinity described by Captain Conder and Lieutenant Mantell in the *Quarterly Statement* for April, 1882, pp. 116–120, and further described by myself in the *Quarterly Statement* for October, 1883, pp. 238–242, the reader is referred to those two articles for the previous history of excavations in this quarter.

On page 241 (as above) I stated that the ruins appeared to extend under ground to the south-east and east of the point where the Mosaic floor (see page 239) was found, and spoke of the desirableness of the work of excavation being extended in those directions. During the past year (1884) this work has been done to a certain degree, and my supposition has been confirmed by the new facts disclosed.

There was found a short distance south-east of the Mosaic floor, the threshold of a door. This was 8 feet long and 4 feet above the level of the Mosaic floor, and may have belonged to a later structure, unless it was a window in the older structure, which does not seem possible. Its size and the work upon it give the impression that it formed an important part of some large building.

The watercourse described on page 239 was found to extend much farther to the east, and in fact it disappears again in the mass of rubbish beyond the limit of the excavations in that direction. Before it disappears it turns by nearly a right angle to the south, and at the angle there is a large basin, or rather a small reservoir, still quite perfect.

Some 30 feet east of the Mosaic floor, and beyond a thick wall which belonged to the later structure, the base of a column, in position, was found, and this, I should judge, evidently formed a part of the older of the two churches which I have described.

Just north of the point where this base of a column was found, the large roof of a later structure has fallen in, and above the centre of its arch, which in the collapse of the building was inverted, the *dêbris* is fully 10 feet deep. This ruined building, whatever it was, now forms part of the mound which has yet to a large extent to be excavated.

Twenty feet south-east of this base of a column a deep channel or passage was found to have been cut in the solid rock, apparently coming from the north, and turning a right angle towards the east, in both of which directions it is covered by the great mound of *dêbris* just mentioned. This passage has been followed down 10 or more feet. The rock walls are vertical, and the passage, which is uniform in width, is 2 feet wide. The rubbish or mound above the surface of the rock is 10 to 15 feet in depth. It will be very interesting to learn the object of this deep channel, and where it leads to. It will be understood that as the bottom of the channel has not yet been reached, I report only the depth to which the clearing has already extended. Perhaps I ought to say that excavations in this particular part of the ruin were suspended nearly a year ago.

Among other things brought to light is a section of a column 15 feet long, 33 inches in diameter, and of the same character as those described on page 241.

The distance from the Mosaic floor to the place where the newly discovered tombs are found is about 60 yards in a south-east direction. They were really discovered by accident. To enclose this large plot of ground, and thus separate it from the road leading up the Jeremiah-Grotto Hill, a high wall was built, and in digging for a foundation for this the workmen dug into the tombs in question. In fact, where the wall passes over them they are very near the surface of the ground, although the *dêbris* on their west side was 10 feet deep.

The five accompanying plans will give a pretty correct idea of the character of these tombs.

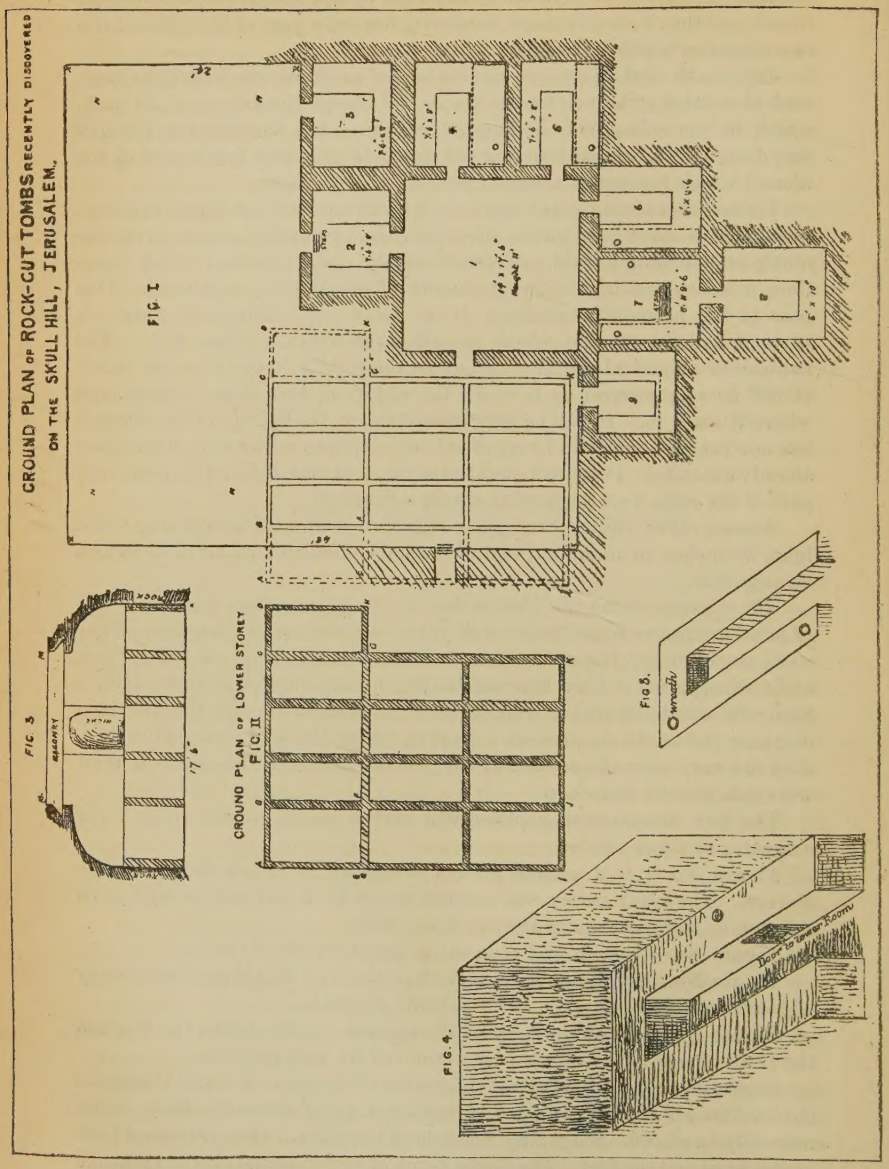
Figure No. 1 is a ground plan of the tombs, of which there are two storeys. The lower storey was covered partly by a roof and partly by the side tombs being cut under the overlying rock.

Figure No. 2 is a ground plan of the lower storey of tombs.

Figure No. 3 shows the vertical wall at the west end of the lower storey of tombs, and how the roof was fitted into the rock.

Figure No. 4 shows the form of the separate rooms, a side, the top, and the front of one of the rooms being removed for that purpose.

Figure No. 5 shows a curious device found in one or more of the tombs (but not in all), namely, a kind of wreath in relief where the head would naturally be placed. Singularly enough, in tomb No. 7 they are found both at the head and the foot. The tombs being of such unusual size it is possible that two bodies were laid on one side, or bench.


GROUND PLAN OF ROCK-CUT TOMBS RECENTLY DISCOVERED ON THE SKULL HILL, JERUSALEM.
FIG. I
GROUND PLAN OF LOWER STOREY FIG. II
FIG. 3
FIG. 4.
FIG. 5.
Door to lower Storey

Room No. 1, Fig. I, seems to have been a large hall or chapel from which the rooms surrounding it led off in different directions. These are numbered from 1 to 9, Fig. I. Underneath these, or portions of them, are other rooms, represented by dotted lines, which are not numbered. The floors of the different rooms are all on a level with the floor of the chapel, with the exception of 2, which is not certain, and No. 8. A person would leave room No. 1, enter the door of room No. 7, and after a few feet ascend four steps and enter room No. 8, which is on a higher level than the others. Room No. 8 is the largest of all the rooms surrounding No. 1, or the chapel.

Between rooms No. 3 and 4 there was a hole or passage, but it seems to have been caused by a subsequent breaking away of the rock rather than to have been a doorway in the original structure.

Underneath a portion of the structure there was a vault for thirteen bodies or sarcophagi, represented in Fig. I, partly by solid and partly by dotted lines, and marked by the letters *A*, *B*, *C*, *D*, *E*, *F*, *G*, *H*, *I*, *J*, *K*. This vault was so constructed that the portion *B*, *C*, *J*, *K*, was roofed over (*MM*, Fig. 3), while the parts *A*, *B*, *I*, *J*, and *C*, *D*, *G*, *H*, were cut under the rock as seen on the right and left in Fig. 3. These thirteen graves were arranged in three rows, five in the western row and four in each of the two others. On the right hand side (see Fig. II and Fig. 3), only one tomb, *C*, *D*, *G*, *H*, was cut under the rock. The reason doubtless was that the designers did not wish to weaken the walls and floor of room No. 1, Fig. 1. The roof stones over *B*, *C*, *J*, *K* (Fig. i), were nicely fitted into the rock as seen in Fig. 3.

At *L* there was a large door, 3 feet wide and 6 feet high, with steps leading from the outside down upon the roof (*MM*, Fig. 3) over the vault *B*, *C*, *J*, *K*, Fig. I. This roof was on a level with the floor of room No. 1, Fig. I. The door at *L*, and that of room No. 1, were nearly opposite to each other. The roof over the vault being now broken in, we cannot say how one descended to it. This roof was 6 feet or 6½ feet above the floor of the vault.

In the vertical wall of the western end of the vault (Fig. 3), over the middle place or receptacle, there is a niche, and a corresponding niche in the eastern wall. These niches were directly opposite to each other, but there being only four receptacles in the eastern row, the niche in the eastern wall must of course have one receptable on one side of it and two receptacles on the other side.

The south wall of room No. 2 has been broken away, but being so much above the level of the vault, neither the roof of that nor any portion of *C*, *D*, *G*, *H* were in any manner affected by it.

The large space on the west, *N*, *N*, *N*, *N*, appears like the bed of a quarry, the general level of which being the same as that of the roof over the vault. This bed slopes considerably, however, towards the south-west. The *débris* over this portion was 10 feet deep, and sloped upwards towards the hill above Jeremiah's Grotto. These tombs were excavated in the western or north-western slope of the Jeremiah-Grotto Hill, and the road by which one ordinarily ascends this hill passes over rooms No. 6, 7, and 8, Fig.I.

Underneath rooms No. 4, 5, 6, 7, and 9, Fig. I, smaller rooms are shown by dotted lines. That under room No. 9 is different in shape from the rest, and not quite perfect. With this exception these rooms are 4 feet wide, 3 feet high, and of the same length as the rooms above them. They are in each case on the right hand of the person entering the rooms. They were entered by doors $2\frac{1}{2}$ feet high, and of nearly the same width, cut in the vertical walls of the benches above them (Fig. 4). In the benches above the small rooms there was in each case a large hole marked by a circle in rooms Nos. 4, 5, 6, and 7, Fig. I. The actual arrangement is best seen in Fig. 4, which shows the interior of one of these rooms, the top, one side, and the front being removed so that the three benches for bodies or sarcophagi can be seen, also the passage into the room, the door in the vertical wall of the bench at the right hand leading to the small room and the hole in the bench above the small room. Room No. 7 has two such holes. (For what were these holes designed?—for ventilation? The Arabs say that they were made so that the dead could speak to each other.)

The walls in all the rooms are vertical, and the ceilings horizontal. This remark is intended to imply that there are no arches lengthways of the rooms, as are found in some tombs, over the benches where the bodies or sarcophagi were placed.

Room No. 8, Fig. I, is noticeable by its size, being larger than any of the others surrounding the chapel. I have explained above that it is on a higher level than the others. Moreover, the places for bodies in front and on the right and left hand were not benches as in the case of the other rooms (see Fig. 4), but open boxes like very large sarcophagi. The lids had been removed, whether by the present workmen or in former times I cannot say. Sarcophagi with their own proper lids may have been placed in these stone boxes.

It is reported that crosses have been found, but I saw none, and none were pointed out to me. Likewise, that inscriptions were found in connection with the broken sarcophagi. These had been removed and taken out of the country (so I was told). It may be, however, that, if they really existed, they were simply concealed in Jerusalem, and jealously guarded by the Latins to whom the place now belongs. I may say in passing that my visits, I felt, were looked upon with suspicion, hence I made my observations as quickly as possible and withdrew so as to avoid giving offence.

Great quantities of bones were found and carefully preserved in boxes, They may hereafter serve some priestly or churchly purpose when the place and time have been prepared for their use.

In the middle receptacle of the western row of graves, over which I have said that there existed a niche, there is a part, perhaps one-half, of a sarcophagus still remaining, and it may be that sarcophagi were placed in all these thirteen receptacles. Perhaps it will be understood without my saying it that what I have called receptacles are sunk in the solid rock.

Owing to a fact which I have alluded to above, my measurements were not minutely exact, but sufficiently so, I trust, for all practical purposes, and I will give some of them in detail. Room No. 1, which I have called a chapel,

is 14 feet by 17 feet 6 inches, and 11 feet high. Room No. 2 is broken, and the same is true of room No. 3, but the latter was 7 feet 6 inches by 8 feet. There was here also, as in some of the other rooms, the small room under the right hand bench. This I have indicated by dotted lines because the room was not absolutely perfect. Its construction, however, was like the others. Rooms No. 4 and 5 were each 7 feet 6 inches by 8 feet, and 6 feet high. Rooms No. 6 and 7 were a little larger, being 8 feet by 8 feet 6 inches, and 8 feet high. Room No. 8 was 8 feet by 10 feet, and 9 feet high, being, as I have said, the most spacious of all those surrounding the chapel. The doors of these different rooms were 6 feet high and about 3 feet wide. The width from wall to wall across the western row of receptacles (see Fig. 3) was 17 feet 6 inches. The entire length of the three rows of receptacles I did not get. The distance from the broken western wall of room No. 3 to the western side of the space marked *N*, *N*, *N*, *N*, is 24 feet, and that from the north to the south side of the same space is 48 feet.

Since the 1st of July of the present year the work of clearing away the rubbish has ceased, and forty or fifty workmen have been busily employed in erecting some sort of a chapel or church over the entire space marked in the plan. My plan, however, is of the ruin as I saw it before the building was commenced. Some parts will necessarily be walled in, but doubtless the idea is to preserve the tombs intact as far as possible.

It may be that some of those who read this article will have seen the model of the Golgotha Hill prepared by General Gordon, and if so they will be interested to know that the tomb represented on the side of that model is only ten yards distant from room No. 8 in my plan. Otherwise the tombs have no apparent connection.

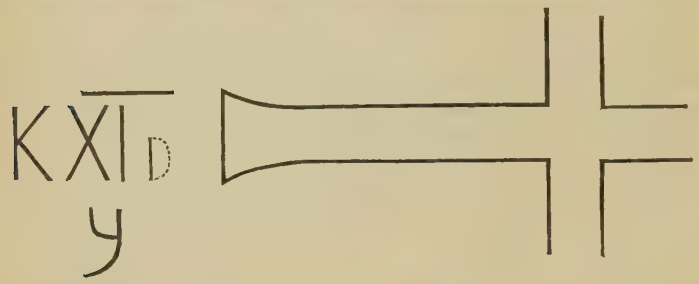
These newly discovered tombs appear to be Christian and not Jewish. It is well known that after the reputed discovery of the body of St. Stephen a magnificent church was erected to his memory by the Empress Eudocia, the wife of Theodosius the younger. The church was dedicated in A.D. 460, and the Empress herself was buried in it. This church was on the north of the city not far from the present Damascus Gate, which for ten centuries subsequent to this event bore the name of St. Peter's Gate. The church was built on the supposed place of the martyrdom of St. Stephen.

Jerusalem, August 18th, 1885.

Postscript.

Since excavations in this particular quarter are assuming, as will be seen by the foregoing article, special importance, I would like to add a note to my description of the two churches which appeared in the *Quarterly Statement* for October, 1883; for the reason that on page 240 a singular mistake has somehow been made. It is in connection with the inscription which I found in the tomb near the Mosaic floor. As printed, two horizontal bars appear before, that is, on the left hand of the inscription, which I certainly did not place there. Two lines below the inscription I wrote: "extends from the '*X*' to the small character at the end;" and instead

of inserting the letter or character "*X*," the printer has substituted the word "cross," which makes a bad mess with the sense I intended to convey. To set matters right it will be necessary to reproduce the inscription and the left hand bar of the cross as follows. It will be understood that the large cross was on the right hand of the inscription to one facing it.



NOTES BY CAPTAIN CONDER.

I HAVE just got the *Quarterly Statement* for July, and though very busy with boundary and land questions here, I should like to send you a note or two. It is a valuable number, and I am only sorry not to have seen the two preceding.

On page 154 I should like to say that though the proposed sites for Golan and Alema are possible, the suggestion of *'Arkûb er Rahwah* for Argob is inadmissible. It has only the B and the R in common, and 'Arkûb is the common word for a "ridge." The Arabic for Argob would be Arjib or Rujib, and such places as Kefr Arjib and the northern Rujib are more suitable. Argob was, however, east of Golan to the best of my remembrance.

On page 159, I think the hot springs near Pella were probably some of those further north at Gadara. The whole of the paper by Mr. Guy le Strange is most interesting. Perhaps he may have noticed whether there are any mason's marks on the masonry at Kala't er Rubud, which would settle the Crusading origin which I always attributed to this castle, which I have only seen in the distance, but which Mr. Tyrwhitt Drake visited and considered Crusading.

Page 183.—The so-called altar at Zorah resembles many rock cuttings familiar to explorers in Palestine, which result from the quarrying of stone. Manoah would hardly have used an altar of cut stone.

Page 184.—The objection as to En Rogel raises the question of the dates and authorship of Old Testament books, which is evidently not one to be discussed in the *Quarterly Statement*.

Page 181.—Mr. Drake and I, in 1873, found what we took to be an overturned Dolmen in Judea, near the village of Jeb'a (Gibeah of

Benjamin), and I have noticed possible traces of others in "Heth and Moab."

I find some difficulty in bridging the gap which seems to me to occur so often in Mr. Birch's arguments between the proposition and the "therefore." He says I am wrong in saying that later kings built a wall round Ophel, but I think the Bible mentions these kings by name. He says he has proved Hinnom to be the Kedron, but if he has done so to his own satisfaction, he has not convinced other writers. Mr. Birch seems to me to forget how often he has changed his own views when he is severe on others for inconsistency. He might, perhaps, not think it worth while to read what I have recently said on the controversies, in the Jerusalem volume, and in my Primer of Bible Geography. At any rate, Mr. Birch admits the impossibility of confining ancient Jerusalem to the small area on Ophel, and if he agrees that David and Solomon walled in the Upper City, his views as to the limitation of the words Zion and City of David are of secondary importance. I hold Zion to be the poetical name of Jerusalem, and the City of David to be the Jerusalem of David's time. All I am really interested in is the defeat of a new heresy which seems to me mischievous and absurd, namely, that the Jerusalem of David and Ezra was confined to the narrow ridge south of the Temple. Such an idea cannot be reconciled with the Book of Ezra, or with earlier biblical books, and represents the *reductio ad absurdam* of Jerusalem controversy.

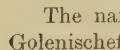
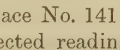
C. R. Conder, *Captain R.E.*

Taungs, Bechuanaland,
August 18th, 1885.

NOTES.

I. Through the kindness of Professor Maspero I am able to correct one point in my note (*Quarterly Statement*, 1885, p. 108) on the identification of the important point Berothah or Berothai, on the northern frontier of David's kingdom.

The name of the place No. 141 in the Karnak List, as given by M. Golenischeff in his corrected readings (*Zeit. f. Aeg. Spr.*, 1882, p. 145 *and plate*) is imperfect in its first hieroglyphic sign, which appeared to me to be = *b*. But M. Maspero has since read it on the pylon at Karnak as , *i.e.*, , so that the name is not Buresu, but Zuresu. This, however, does not affect my proposal to identify Berothah with Brisa in the wâdy where M. Pognon found the rock-inscriptions of Nebuchadrezzar.

II. In my short article in the April *Quarterly* on Exploration in the Nile Delta there are a few insignificant misprints which every reader will correct for himself; but one needs explicit notice. On page 115, for  read  , the last sign being the determinative, a serpent,

Henry George Tomkins.

I LAST week forwarded you tracings of plan of the recently discovered Zorah altar. That it is "strongly suggestive" of the passage Judges xiii, 19, 20, is undeniable.

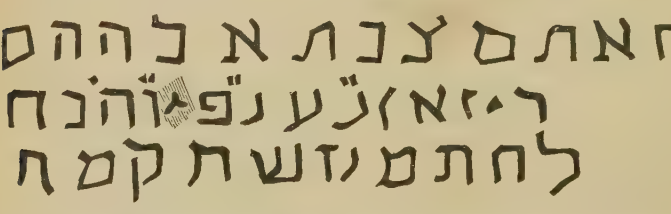
I would now merely call attention to the fact that "the great stone of Abel," which appears to have marked the limit or boundary between the Beth Shemesh lands and the Philistine territory (1 Sam. vi, 12–19) could not have been far distant. The shrine of Abu Mésar at Ain Shems (Beth Shemesh) is boldly visible from the altar, and about three-quarters of an hour's walk distant (at the furthest) in a south-west direction.

Standing on the hill-sides close to Zorah, with the altar and Ain Shems in full view, the two old narratives seem to assume new and living proportions, and blend and dovetail wonderfully at the spot where stands the lately found sacrificial monument.

In conclusion, I would mention that the German Exploration Society have excavated the altar, the total height of which is 2 metres. I believe that excavations are still being carried on at Artouf for the same Society.

J. E. HANAUER.

A FEW weeks ago I had to survey a part of the interior of *Tiberias*, and found by chance a small column of white marble 1 foot 5 inches long and 9 inches in diameter, which was just dug out in the garden of the Greek convent in the extreme south of the town, and which bears the following Hebrew inscription:—



I am not a Hebrew scholar, but I was told that it bears the date 4148, and was a gravestone.

I have also looked with interest into the large circular vaults which border Tiberias from the sea side, and are built close to the city wall of the east and south. They are not built very carefully, but are strong and very spacious. Their building area must be that of this last city wall and fortress. The city wall on the sea side is generally 10 feet 2 inches thick. The new Greek convent will now be built on top of its south-eastern corner, and the partly sunk round corner tower there will be restored.

Haifa, July 31*st*, 1885.

G. SCHUMACHER.

A NATURALIST'S JOURNEY TO SINAI, PETRA, AND SOUTH PALESTINE.

By H. Chichester Hart.

CHAPTER I.

Introductory.

Early in the summer of 1883 my friend Professor Hull, Director of the Geological Survey of Ireland, proposed to me that I should accompany him as a volunteer on a geological and surveying expedition to Sinai and the Dead Sea, of which he was about to take the leadership under the auspices of the Palestine Exploration Society.

With the main object of studying the botany of this region, and as far as possible also other branches of its natural history, I accepted this friendly offer. I was chiefly induced to do so by the assurance I received from Professor Oliver, of Kew, that, whatever our Continental brethren may have accomplished, few British botanists had as yet turned their attention to Sinai. He at the same time promised his valuable assistance in the determination of my specimens upon my return—a promise since fulfilled in a manner which entitles him to my sincerest thanks. Another welcome consideration which helped to determine me was that of a grant of money from the Scientific Fund of the Royal Irish Academy.

I feel bound to take this earliest opportunity of expressing my grateful sense of the courtesy of the Rev. Canon Tristram, the well-known authority on the Natural History of Palestine, who has helped me with his advice before starting, and his scientific assistance since my return. To him the determination of my species of birds, as well as of land and freshwater molluscs, is almost entirely due, and his recent work on the "Fauna and Flora of Western Palestine" has been continually consulted in preparing the present account.

To Dr. Gunther, F.R.S., and to Messrs. Waterhouse and Thomas, of the British Museum, my thanks are due for the naming of other smaller collections of mammals, reptiles, and beetles. Mr. Edgar Smith, of the Conchological Department, has also been good enough to render me as much assistance as his duties would permit in searching for information on the Mollusc-fauna of the Red Sea.

To Mons. Edmond Boissier, the eminent Swiss botanist and author of the invaluable "Flora Orientalis," I desire to tender my warmest acknowledgments. He has very kindly determined for me some of the more intricate genera, which his unrivalled knowledge and extensive Oriental herbarium enable him to deal with satisfactorily. Of Mons. Boissier's "Flora Orientalis" I have constantly availed myself in dealing with the flora of Sinai. Botanists whose inclinations turn, as mine do, to the geographical distribution of plants will find this work, which is now complete, a perfect storehouse of information.

Reference must here be made to the Ordnance Survey of Sinai, published in 1869, where much valuable information on the physical features and natural history of the Peninsula will be found, especially in the appendices by Mr. Wyatt. An interesting paper by Mr. Lowne, on the Flora of Sinai, in the Journal of the Linnean Society for 1865, may also be referred to; his nomenclature, however, differs widely from that at present adopted. There is little other botanical literature available; Decaisne's *Florula Sinaica*, published in the "Annales des Sciences Naturelles" in 1836, in which many new species are described, is difficult to obtain separately; it is, however, very valuable, but the collections of Schimper and others, distributed throughout the herbaria of Europe, and duly recorded in Boissier's "Flora Orientalis," have nearly doubled Decaisne's original total.

I desire also to express my gratitude to Mr. A. G. More, the well-known naturalist in charge of the Natural History Department of the Museum of Science and Art in Dublin, who has been always most good-natured in rendering me advice and assistance as far as lay in his power.

I must not omit to acknowledge the judicious and kindly guidance by which (with the assistance of our most efficient interpreter and conductor, Bernard Heilpern) Professor Hull brought our travels to a safe conclusion. In a volume recently published by the Society, Professor Hull has given the public an account of our experiences, and to it, and its Appendix by Major Kitchener, the reader may turn for fuller geological, geographical, and other information relative to our explorations. To the other members of our party, for their continual kindness in obtaining specimens for me, I shall feel for ever grateful.

In these pages, which owe their appearance to the liberality of the same Society, I propose in the first place to give a running account of the collections made in the order in which they were gathered, with such extracts from my journal as may serve to illustrate them. Afterwards I will enumerate in detail the various species which I have identified, and conclude with an endeavour to give a full account and analysis of the Flora of Sinai, or rather of the Sinaitic peninsula of Arabia Petræa.

For the systematic list of plants, with their localities, I refer my readers to the Transactions of the Royal Irish Academy, where descriptions of the new species with figures will be found. The specimens themselves are in the Herbaria of Kew and the British Museum.

CHAPTER II.

Ain Musa to Wâdy Lebweh.

Having left Suez on Saturday, November 10th, 1883, we took up our quarters till Monday at Ain Musa, the usual starting place for Sinai. A description of the gardens here, with the introduced plants found about them, has been given by Mons. Barbey, in his recent volume "Herborisations au Levant," who visited them at a more auspicious season. His tour did not elsewhere cover the ground we visited till reaching Bir es Seba.

At Ain Musa my hopes fell to a low ebb. With the exception of a couple of showy flowering shrubs (*Lantana camera Linn.*, and *Cassia bicapsularis Linn.*) in the gardens of date palm, bounded by prickly pear, there appeared to be hardly a vestige of unwithered vegetable life. Closer inspection, however, yielded dead flowers and ripe seed capsules of several species, all of which were carefully preserved for comparison with subsequent gatherings. One species, *Ceratophyllum demersum L.*, found drifting in the gulf, and probably derived from the canal, was not met with again. A prostrate prickly grass in the sandy stony flat between the wells (*Ain Musa*) of Moses and the gulf has been named for me by Mons. Boissier, *Sporobolus spicatus Vahl.*

In these enclosures, and around their edges, were bushes of tamarisks and "ghurkūd," *Tamarix nilotica Ehr.*, *T. articulata Vahl.* (?), and *Nitraria tridentata Desf.* The latter is a prickly, fleshy-leaved shrub with small orange berries, greedily eaten by camels. It belongs to the "bean-caper" family (Zygophyllaceæ), well represented in the desert.

From one of the wells numerous univalves, all of one species, *Melania tuberculata Mull.*, were obtained. The net produced nothing else except the larvæ of a gnat. A chamæleon (*Chamæleo vulgaris Linn.*) and a small very nimble brown lizard (*Eremias gutto-lineata*) were captured close by. The former was pointed out to me by a Bedouin on a stunted palm-tree, else I should assuredly have passed it by, so closely did it resemble the branch along which it clung.

The chief attraction at this oasis was in the birds, of which several species were obtained. Amongst these were the white wagtail and the willow-wren (*Motacilla alba Linn.*, and *Phylloscopus rufus Bechst*). A buff-backed heron, *Ardeola russata Wagl.*, was seen but not shot: this is the bird which does duty for the "white ibis" amongst visitors. A little cock-tailed warbler with a song and habit of a wren, *Drymoeca inquieta Rupp*, as well as the blue-throated robin, *Cyanecula cæruleculus Pall.* (the one with the entire blue throat), was shot here.

Across the sand to the shores of the gulf many kinds of sea shell were gathered. A detailed account of these, as well as of those obtained at Akaba, will be given later on. Few specimens worth preserving were met with, but they were for the most part identifiable. At the water's edge a stork gave me a long shot, and several dunlins were flying about.

At evening the air was filled with the attractive notes of species of cicada, and the quaint call of an owl (*Athene meridionalis Risso.*), the "boomey" of the Arabs, was for the first time heard.

Insect life was almost suspended, but a few small beetles (*Adesmia*, *Acis*), ants (*Camponotus*), and a spider or two, as well as a torpid scorpion, were captured about here, and between this and Wâdy Nusb.

Excepting at wells, met with at rare intervals, life of all kinds was very scarce in this lower desert portion of Sinai. The appearance of a bird within a quarter of a mile in these wastes was a signal for a general call to arms amongst the gunners, and the gurgling sound of the Bedouin camel-driver summoned his obstinate beast to kneel and let

his rider dismount and stalk a distant Egyptian vulture or a raven. These two birds, *Neophron percnopterus Linn.* and *Corvus umbrinus Hedenb.*, were frequently in sight, but rarely in range.

After a day or two, when my Bedouin lad, Khalîl, had discovered which of us two was master, I generally travelled on foot, letting my camel-driver keep me in view till wanted. For this interesting and faithful son of the desert I conceived a great liking. This feeling towards the Arabs is very frequently indulged in by inexperienced travellers in the East.

As fast as I made gatherings, I was able to deposit them on the back of my admirable beast of burthen. For this purpose I had two sets of camel bags and drying boards, as well as multifarious swinging gear; guns, spy-glass, water-bottle, shoulder-bag, spirit cylinder, portfolios, insect box, *et hoc genus omne.*

The country traversed was of gravel and sand, with occasional outcrops of limestone. This limestone sand is sometimes finely and regularly granulated, as near Wâdy Sudr, a condition not observed by us in other parts of Sinai. The view of the Jebel Rahah mountains across the Gulf of Suez was superb.

Our direction lay nearly parallel to this arm of the Red Sea, gradually widening the distance between us and the coast-line. The sky was of a brilliant blue, and the temperature rarely hot enough to make walking disagreeable. The following plants were observed in Wâdy Sudr:—*Zilla myagroides Desf.*, *Retama retam Forsk.*, *Alhagi maurorum D.C.*, *Acacia Seyal Del.*, *Deverra tortuosa Gœrtn.*, *Anabasis articulata Forsk.*, *Reaumuria vermicularis Linn.* (*R. palæstina Boiss.*), *Fagonia cretica Linn.*, var. *glutinosa* et vars., *Erodium glaucophyllum Ait.*, *Citrullus colocynthis Lehr.*, *Artemisia judaica Linn.*, *Odontospermum graveolens S. Bip.*, *Gymnocarpus fruticosus Pers.*, *Paronychia desertorum Boiss.*, *Ærua javanica Juss.*, *Heliotropium luteum Poir.*, *Aristida obtusa Del.* Most of these are strictly desert species of continual occurrence in the lower parts of the peninsula, and will seldom again be referred to. In Wâdy Sudr *Farsetia ægyptiaca Turr.* and *Anabasis setifera Moq.* were also obtained.

The Citrullus bore its ripe fruit, orange-coloured and about the size of a billiard ball, trailing on the gravel and sand in many places.[1] The felted Ærua was laden with tassels of wool, the remains of its withered inflorescence; the variety, with narrower leaves and more rigid habit,

[1] The Arabs use this species (the colocynth) as a purgative. A fruit is split into halves, the seeds scooped out, and the two cavities filled with milk; after allowing it to stand for some time, the liquid, which has absorbed some of the active principle of the plant, is drunk off. I refer my readers for further valuable information of this nature to an article in the *British Medical Journal* of April 11, 1885, by my friend and companion, Dr. Gordon Hull. I trust he will forgive me for correcting an error into which I unfortunately led him. The plant which he speaks of "with short succulent jointed segments" as being very common and used for sore eyes is not Zygophyllum but *Anabasis* (*Salsola*) *articulata.*

occurred later on. Acacia Seyal was a revelation of spinousness whose branches even the camel can only nibble with care. It is a low flat-topped bush, often only 4 or 5 feet high, but with a trunk of considerable thickness.

A Matthiola, probably *M. arabica Boiss.*, occurred, and a large cabbage-leaved sticky Hyoscyamus, *H. muticus Linn.*, with showy yellow and purple veined flowers, was pointed out to me as the "Sekkaran" which the Arabs are said to inhale in their narghilis as an intoxicant

The pretty little woolly Reaumuria, with its densely imbricated leaves, was, after much searching, found in blow at last. A wiry, nearly leafless Deverra was in full flower and seed, with a strong but not unpleasant smell of fennel.

The marked characteristics of these desert plants soon become familiar, They have usually a whitened appearance, which was perhaps somewhat heightened at the season of my visit. This is due to woolliness, or scaliness, or some other colouring integument, and is frequently accompanied by heavy odours, succulent or glaucous foliage. Spines, prickles, hooked or clinging hairs are also characteristic, and the whole plant is not unfrequently found to be steeped in a strong viscid exudation. Noteworthy instances of the above peculiarities will be given farther on.

Of the Sinaitic mountains, no part was as yet visible ; we were however gradually rising above sea-level, and with the cooler atmosphere there was a steady increase also in the quantity of vegetation. A very fragrant bushy Artemisia, *A. santolina Linn.*, had become frequent, and is subsequently one of the most characteristic plants of the flat wâdies.

In Wâdy Sudr *Cleome arabica Linn.*, *Pennisetum dichotomun Del.*, and *Elionurus hirsutus Vahl.* were secured in good condition, except the latter grass, which is so closely eaten by camels that it is hard to obtain good specimens.

Anabasis articulata Forsk. is a prevalent low-sized species ; its dried twigs are always topped by a few scales, the remains of the floral envelopes. These are occasionally a showy red or claret colour, and give a brilliant effect, sometimes equalling that of red heather at a distance. It is perhaps the commonest species throughout Sinai ; *Gymnocarpum fruticosus Forsk.*, however, is nearly as abundant. The Anabasis, whose slenderer twigs are, I believe, all lost and withered at this season, accumulates round its roots blown hillocks of sand a couple of feet high, favourite hiding places for lizards, and burrowing ground for ants and the smaller rodents. The Bedouins called this plant "Erimth."

The vegetation is scattered in tufts amongst the sand and gravel ; except in the occasionally moistened wâdy beds these tufts are usually isolated and often far apart.

On the 13th, at about 350 feet above sea-level, we entered a bed of chalk intermixed with white marls strewed with chert, fossils, and selenite. We reached Ghurundel by moonlight. Tamarisks and palms (*Tamarix nilotica Pall.*, *Phœnix dactylifera Linn.*) form here a pleasant grove ; Zilla, Nitraria, and most of the species above mentioned, are plentiful.

At Wâdy Ghurundel ("Elim")[1] I obtained some fresh species of birds. Of these *Saxicola isabellina Rupp* (Menetries' Wheatear) was several times seen and shot. The "Persian lark" (*Certhilauda alaudipes Desf.*) and the striolated bunting (*Emberiza striolata Licht.*) were obtained, only single specimens being as yet seen and secured of each. Ravens and willow-wrens tenanted this wâdy.

The first large quadruped's tracks were pointed out by the Arabs; they exclaimed "dhaba"—that is to say, "hyæna."

Another lizard, *Agama ruderata Riv.*, and a skink, *Sphœnops capistratus Wagl.*, were captured here. The latter I found on kicking to pieces an ant-hill, the home of a species of Camponotus, *C. pubescens*. This lizard was afterwards very common throughout Sinai to the Dead Sea. He was easy to catch, and his comical habit of standing at bay with his tail cocked and his disproportionately large jaws wide open was instructive; no doubt it terrified troops of smaller foes. Like most true natives of the desert he was sand-coloured, though the tail has some dull blackish rings. Another lizard, *Eremias guttata*, was most difficult to catch; by pelting him with handfuls of sand, which confuses and stops his movements for an instant, combined with a sudden rush, it may be done.

The rock here is a white cretaceous limestone. The bed of the wâdy is cut deeply into marly deposits, leaving sheer mud-banks sometimes 8 feet high. The bed of this periodic stream was now perfectly dry. From the appearance of these deposits, and those in other places, Professor Hull considered there was evidence of a much greater rainfall in recent times.

On the tamarisk branches a curious buff-coloured chrysalis-like appendage was frequently observed. It was about the consistency of tough paper half an inch long, but more brittle, and proved to be the egg case of a species of Mantis. A large black beetle, *Prionotheca coronata Oliv.*, was the only large insect found in Wâdy Ghurundel.

Several plants were here first met with; the most conspicuous were a shrubby mignionette, *Ochradenus baccatus Del.*, thenceforward characteristic of the lower desert wâdies, and sometimes, where protected by acacia trees from camels, 6 or 8 feet high.

Here or nearer to Wâdy Useit I noticed for the first time a second species of acacia, *A. tortilis Hayne*, less spiny and usually larger and more upright than *A. Seyal L.* I met only these two acacias in the peninsula, but I found a third and much finer one (*A. læta R. Br.*) at the south end of the Dead Sea. *A. nilotica Del.* also occurs in Sinai. *A. tortilis* is commoner in the Arabah than elsewhere.

Other species were—*Cucumis prophetarum Linn.*, *Polycarpæa fragilis Del.*, *P. postrata Dcne.*, *Zygophyllum album Linn.*, *Fagonia cretica Linn.*,

[1] This wâdy must not be confounded with others of the same name in Sinai and Edom. A notable instance of confusion occurs in the ninth chapter of the English translation of Laborde's "Arabia Petræa," 1836, where the translator quotes several pages of description of the present wâdy from Burckhardt, to illustrate Laborde's short and correct mention of Wâdy Ghurundel near Petra.

var. *arabica*, *Lithospermum callosum Linn.*, *Cressa cretica Linn.*, *Euphorbia cornuta Pers.*, *Juncus maritimus Linn.*, *β arabicus*, *Typha angustata B. & C.*, *Cynodon dactylon Pers.*, *Phragmites communis Linn.*, var. *gigantea*. This latter species, which reaches a height of 10 or 12 feet with its erect plume of florescence, is a truly handsome grass. It appears to have frequently done duty for *Arundo Donax L.* in Sinai.

Many withered Chenopods occurred here, the identifiable species being *Suæda vermiculata Forsk.*, *Atriplex leucoclada Boiss.*, *A. halimus Linn.*, *Anabasis setifera Moq.*, and *A.* (*Salsola*) *articulata Forsk.* At Wâdy Useit occurred a little grove of date palms, some of them at least 40 feet high. There is only one other species, the doum palm (*Hyphæne thebaica Del.*), in Sinai. It occurs near Akaba and at Tor.

From about Wâdy Saal small burrows, from the size of a small rabbit-hole to the little perforation of a species of ant, *Camponotus compressa Fab.*, become numerous. These belong chiefly to species of Acomys, Gerbillus and Psammomys, but it was some time before I succeeded in capturing any of these animals. On several occasions I saw individuals of the Gerbille genus of sand-rats. These animals usually burrowed in the sand-hills accumulated about the stumps of anabasis and tamarisk ; their abundance here was as nothing compared with their numbers in the Wâdy Arabah later on. Jerboas were not seen in Sinai.

At night in the dinner tent our lights usually attract a few nocturnal insects, which I capture from time to time.

A hornet, *Vespa orientalis Linn.*, is the only insect frequently to be seen in the day-time. Nature rests herself in the desert almost as thoroughly as in an Arctic winter ; in the latter case she sleeps during an excessive cold, in the former she exhausts her strength during an extreme heat. Nevertheless many late flowering plants still occasionally hold their petals, and it will not be many days ere we gather the first harbingers of spring. Possibly these latter should be called hybernal. A few species, as *Cleome arabica Linn.*, are in their prime at present for examination, being in full flower and fruit. This Cleome is one of the most viscid plants met with, taking many weeks to dry, and never shaking off the adhering sand. It has small deep purple flowers and longish pods.

A black snake, probably *Zamenis atrovirens Shaw*, var. *carbonarius*, was killed here, but I was informed it was last seen with the cook. Whether it subsequently passed under examination in the dinner tent I cannot say, but I never succeeded in identifying it.

Desert larks representing three genera have been obtained ; one of these, Certhilauda, has been already mentioned. Other two, *Ammomanes deserti Licht.*, and *Alauda isabellina Bonap.*, were also shot. The latter is one of the most frequently met with of the true inhabitants of the desert. The Persian lark (*Certhilauda desertorum Rupt.*), a bird about the size of our song-thrush, has a low sweet song, uttered while on the ground, and not much stronger than or unlike our robin's winter warble. A large and handsome black and white chat (*Saxicola monacha Temn.*) was shot in Wâdy Humr. Tracks of gazelles were here first observed.

At Wâdy Humr we are crossing beds of a highly coloured red sandstone, which has replaced the white and black weathered limestone. The black and white chats are more conspicuous amongst these rocks; when at rest on a chalky surface dotted with fragments of chert these birds are not quickly seen. The desert larks are, however, the most securely assimilated to the soil. The females of some chats (*e.g.*, *S. monacha*) are more protectively coloured than the males.

The sandstone which we are now traversing is the regular inscription rock of the desert, on which the Bedouins of all ages have delighted to air their calligraphy, and not unfrequently impose upon travellers with their rude tribe-marks.

Our direction is mainly south-east, and steadily rising. At the head of Wâdy Humr, about 1,300 feet above the sea-level, we obtained our first view of the Sinaitic mountains. Jebel Serbal stood out, grand and rugged, straight ahead of us, looking about one-half of his real distance from us, so excessively clear was the atmosphere.

Leyssera capillifolia D.C. was gathered here for the first time, and the favourite camel grass, *Elionurus* (*Cœlorachis*) *hirsuta Vahl.*, was gathered in flower.

Having left Wâdy Humr, and crossed Sarbut el Jemel at a height of about 1,700 feet above sea-level, we came out on a wide sandy plain, Debbet er Ramleh, lying about 1,700 to 1,850 feet above sea-level. This is the largest expanse of sand in Sinai, and covers about thirty square miles. Some very interesting species were gathered here. The two species of Polycarpæa already mentioned, with the Cleome, abound.

Seetzenia orientalis Dcne., *Glinus lotoides Linn.* (not in flower), *Monsonia nivea Dcne.*, *Pancratium Sickembergeri A. & S.*, *Danthonia Forskahlii Linn.*, *Aristida plumosa Linn.*, and *A. obtusa Del.* These were all obtained in flower, and the white and perfect Pancratium was at its best. It is a lovely flower, and I secured many bulbs here and elsewhere. No leaves were yet in sight, but in some cases the petals had fallen, and the seed pod was filling, showing that the leaves are certainly not synanthous, though appearing soon after the flowers. Plants of this species now growing with me do not exhibit the remarkable twisting described as characterising their leaves. On this Pancratium, which was first discovered by Sickemberger near Cairo, some interesting remarks will be found in Barbey's "Herborisations" already mentioned.[1]

The Aristidæ, small glaucous grasses with long feathery awns, are amongst the prettiest of desert forms.

At a lower level near this, *Lycium europæum Linn.* was plentiful, and in full flower. It is visited by a small copper butterfly, the first of its family met with, which is poorly represented in this dry region. Formicidæ and Acridiidæ (ants and locusts) are perhaps the most abundant insects.

In Wâdy Nusb several fresh species occurred. Unrecognisable fragments awoke my regrets at the season selected from time to time.

[1] "Herborisations au Levant," par C. and W. Barbey (Lausanne, G. Bridel, 1882).

The following were determined :—*Morettia canescens Boiss.*, *Astragalus sieberii D.C.*, *A. trigonus ? D.C.*, *Crotalaria ægyptiaca*, *Bth.*, and *Convolvulus lanatus Vahl.*

These Astragals were quite withered, and simply well-rooted bunches of strong sharp spines, 2 to 3 inches long, set closely round a stumpy stem ; the spines being the hardened woody mid-rib of the pinnate leaves. The only evidence of their past condition lay in the slight cicatrices in the spines marking the points of attachment of the fallen leaf-pinnæ. Of the convolvulus, a handsome, erect, shrubby, felted species, with good-sized reddish-purple petals, I obtained a couple of flowers.

Desert partridges were first heard here, but not yet obtained. Chats and larks appeared to be pairing. A shrike, *Lanius fallax Finsch.*, was first seen and shot. Afterwards this became a familiar species. The "desert blackstart," *Cercomela melanura Temn.*, another very characteristic and prevalent bird of Sinai, was also first met with and obtained here. The chats were *Saxicola leucopygia Brehm.*, and Menetries' wheatear already mentioned. The trumpeter bullfinch, *Erythrospiza githaginea Licht.*, was shot here for me by Dr. Hull, who, as well as Mr. Reginald Laurence, brought me specimens from time to time.

In Wâdy Nusb there is a well, and quite a goodly show of acacias, chiefly of the species *A. tortilis Hayne*, which was in flower sometimes, and usually in leaf. The leaf segments of this species are larger and fewer in number than in *A. Seyal L.*, the pods are twisted, and the tree attains a greater size. When old it is less and less spiny, while the reverse seems to be the case in *A. Seyal.*

In this wâdy I gathered *Malva rotundifolia Linn.* and *Amarantus sylvestris Desf.* by the well, both probably of human origin. The former is cooked and eaten by the Bedouins. *Lycium europæum* has flowers either white or pinkish-purple. Other species met here first were—*Dæmia cordata Br.*, *Echiochilon fruticosum Desf.*, *Lavandula coronopifolia Poir.*, *Crozophora obliqua Vahl.* (a perennial form of *C. verbascifolia Juss.?*), and *Zizyphus spina-christi W.* The latter was not native, and occurred in a miserable little enclosure by a Bedouin's hut at the well. It was less thorny than the native species afterwards gathered, and the fruit somewhat larger, but Mr. Oliver refers it to the same plant, no doubt slightly altered and improved by a rough system of cultivation.

As we are gradually increasing our elevation amongst the wâdies derived from the precipitous escarpment of the Tîh plateau (4,000 to 5,000 feet), so there are more remains of last summer's vegetation—later in flowering perhaps, and less scorched than the same species below.

Soon after leaving Wâdy Nusb we entered on plutonic formations, a red porphyritic granite, which was thenceforth to accompany us upwards over a large extent of country. The increased quantity of acacias since we left the limestone, and especially on the granite, is noteworthy. Perhaps its ferocious spines require an admixture of silicon.

A locust and a cricket were taken in semi-torpid condition. Scorpions similarly harmless, have been caught from time to time.

A larger species of lizard, with a handsome blue throat and pectoral, was captured, *Agama sinaitica Heyden.* The bright colour was all below, and was no reproach upon the perfect assimilation of its upper parts with the desert sandy hues. This lizard hid himself amongst stones, and it was with difficulty I dislodged him from a hole which he filled with his body and fortified with his distended and savage little jaws.

Having crossed a high ridge of granite, Ras Suwig, at about 2,400 feet above sea-level, from whence Jebel Serbal looked magnificent, we descended into a wâdy which yielded several new plants. *Pancratium Sickembergeri A.* & *C.* was found in flower here also. A small bulb, apparently an Allium, was brought to me by some Bedouins, perhaps *A. sinaiticum Boiss.* It is growing now under Mr. Burbidge's care at the College Botanic Gardens, but has not yet flowered. These two bulbs and a Uropetalum (*U. erythræum Debb.*) are, I believe, the only ones which support life in this desert. A few others occur, but at sufficient heights, usually very considerable, to bring them into a different zone of plant life.

At the height of 2,200 to 2,400 feet above sea-level the following species appeared :—*Iphiona juniperifolia Coss.*, *Sonchus spinosus Del.*, and a very fetid species, *Ruta tuberculata Forsk.*, was here first obtained with its yellow flowers.

Major Kitchener brought me branches here of the first Capparis I had seen, *C. galeata Fresen.*

Lichens of two species at least occurred, one on the bark of acacia, and the other on sandstone.

In Wâdy Khamileh desert partridges, *Caccabis Heyi Temn.*, were frequent, and some were shot. Two desert plants occurred in some quantity, *Lotononis Leobordea Linn.*, and *Pulicaria undulata D.C*

CHAPTER III.

Wady Lebweh to Mount Sinai.

Still ascending gradually, up Wâdy Lebweh, from 2,500 to 3,500 feet, many interesting Sinai plants were gathered. Most of these are true desert species, which reach about thus far, but they are mixed with others of an intermediate elevation about corresponding to the Mediterranean flora. From here come *Glaucium arabicum Fres.*, *Caylusea canescens St. Hil.*, *Cleome trinervia Fres.*, *Fagonia myriacantha Boiss.*, *Tribulus terrestris Linn.*, *Peganum harmala Linn.*, *Neurada procumbens Linn.*, *Santolina fragrantissima Forsk.*, *Artemisia herba-alba Asso.*, et var. *laxiflora Sieb.*, *Anarrhinum pubescens Fres.*, *Trichodesma africana R. Br.*, *Heliotropium undulatum Vahl.*, *Gomphocarpus sinaicus Boiss.*, *Ballota undulata Fres.*, *Teucrium polium Linn.*, β. *sinaicum*, *Stachys affinis Fres.*, *Primula boveana Dcne.*, *Acanthodium spicatum Del.*, *Forskahlea tenacissima Linn.*, *Andrachne aspera Spr.*, *Asphodelus fistulosus Linn.* and others, the specimens too bad

to name. The labiates in the above group are characteristic of the middle and upper zones of Sinai.

On the summit of Zibb el Baheir, at 3,890 feet, a point which all travellers should climb for the sake of the really splendid view, *Gypsophil rokejeka Del.*, *Helianthemum Lippii Pers.*, *Iphiona montana*, and a Poa, *P. sinaica St.* (*?*), were gathered. A Psoralea occurs here also, not found in a recognisable state. It may have been *P. plicata Del.*

Of the plants just enumerated several are peculiar to Sinai. Others, believed endemic, I found later on Mount Hor in Edom.

In addition to the above it is to be remembered that the majority of the earlier species met with occur throughout. The chief failures are *Cleome arabica Linn.* and Salsolaceæ (except Anabasis), which are mostly confined to the lower plain. The variable but always pretty little Fagonia is continually arresting the attention by some new deviation. Sometimes it is glabrous, sometimes viscid, sometimes very leafy, at others a bunch of twigs or thorns, trailing or sub-erect, while the flowers vary much in size. In one form or another it is a very widespread desert form which has received a number of segregational names. The abnormal *Neurada procumbens*, with its curious flat prickly-edged capsule nearly an inch in diameter, was in good condition, but scarce. *Gomphocarpus* was in full flower and fruit; like *Dœmia cordata*, already gathered, and now common, it has a sticky, staining, milky juice, very poisonous according to the Bedouins. These two Asclepiads, and about five others occurring in Sinai, point to the tropical element in its flora. *Artemisia herba-alba Asso.*, in several well-marked forms, is henceforth one of the most abundant and highly aromatic plants.

From Zibb el Baheir, which I ascended with Dr. Hull on Sunday, the 16th November, we had a grand view of the whole mass of Jebel Musa (Mount Sinai) and Jebel Catharine on the south-east, and of Serbal nearer us to the southward. Down Wâdy Berah the foregoing labiates and composites were prevalent in many places. A little further on is a continuous grove of retem bushes, the first bit of almost luxuriant though limited vegetation I had seen except close to the wells. This wâdy, like most others, is flat, and about half a mile wide, with a slight channel wandering from side to side, and marked by a line of grey-green growth, no doubt fresh and delightful after the rain which is almost due.

Hares have been seen once or twice. I saw one here first, a very long-eared and long-legged whitey-grey animal with a little body (*Lepus sinaiticus Hemp.* and *Ehr.*). He was a perfect fiend to travel; nothing living except a bird ever got out of my sight so quickly. The little southern owl hovered around our camp one or two evenings. A splendid pair of griffon vultures afforded a nearer view here than elsewhere. The Egyptian species is more approachable. Crows and ravens (*C. corax* and *C. umbrinus*) are also tamer in this less frequently traversed route. Indeed the large birds generally seem fully aware of the harmless nature of Cairo powder. The lark, *Alauda isabellina Bon.*, is the commonest of the smaller species. White wagtails, *Motacilla alba Linn.*, are also very

frequent, continually hopping about our tents and camels quite fearless of man.

The two lizards of the *Agama* genus already mentioned, especially the smaller (*A. ruderata*), are common. I kept some of these alive as far as to Constantinople three months later, but the cold weather there killed the last of them.

The mountains are of red porphyry intersected by numerous dykes of trap. This is surely the proper country for a geologist to come to ; no annoying mantles of soil or vegetation conceal the rock masses ; all is bare and clear, and a good view reveals as much as a shire full of well-borings and railway cuttings.

The temperature has become much colder, falling to within five or six degrees of freezing point at night, and we find it difficult to keep warm enough in our tents.

Acacia bushes become rare or absent at about 3,500 feet elevation. Acacias may be said to mark the vertical limits of the desert flora, as the date palm does its horizontal geographical distribution. The desert plants which exceed this range upwards will be found to be mostly Mesopotamian or Syrian species, and not confined to that belt which extends from the Cape Verdes to Scinde.

In Wâdy es Sheikh some large tamarisk bushes (*T. nilotica*) occur, about 15 feet in height. This plant has about the same upward limit as that of the acacia. On these tamarisks were two butterflies, one of which, *Pyrameis cardui Linn.*, was obtained ; the other appeared to be a fritillary (Argynnys).

The Wâdy es Sheikh is of considerable length, upwards of twenty miles, running east at first, and then south to the base of the Jebel Musa group. It lies high, 3,000 to 4,000 feet, and the chief plants in it are Artemisiæ, Santolina, and Zilla, except on the northern sides at the base of whatever shelter from the sun there may be. Here most of the plants lately enumerated occur still. Some appear which are less common, as *Zygophyllum album Linn.*, *Nitraria tridentata Desf.*, *Alhagi Maurorum D.C.*, *Crozophora obliqua Vahl.*, *Pancratium Sickembergeri A.* and *S.*, and the labiates and composites of Wâdies Lebweh and Berah. *Gomphocarpus sinaicus Boiss.* often arrests attention, shedding its beautifully silky tufts of hair, ready to whisk the attached seeds about the peninsular plains with every breath that blows. *Phagnalon nitidum Fres.*, *Anabasis setifera Moq.*, and *Atriplex leucoclada Boiss.*, occurred in Wâdy Solaf, so that the Salsolaceæ only require favourable circumstances to appear in the upper country. In Wâdy Solaf, a smaller arm of the Wâdy Sheikh, remarkable sections of marl deposits, many feet in thickness, were examined. These no doubt represent the bed of a large lake of the recent period cut through by streams which once contained a steady supply. Examination of evidence of this nature will form an interesting portion of Professor Hull's results.

At Jebel Watayeh a fine granitic pass connects the eastern and southern prolongation of Wâdy Sheikh. The summit of this I estimated at 4,150 feet above sea-level. On it I obtained *Dianthus Sinaicus Boiss.*, *Buffonia*

multiceps Dcne., *Arenaria graveolens Schreb.*, *Cratægus sinaica Boiss.*, *Cotyledon umbilicus ? Linn.*, *Poa sinaica, ? St.*, and most of the species of Zibb el Baheir. The withered Psoralea (sp. ?) occurred also. The first two of these are peculiar to Sinai. There was a well-marked difference here in the floras of the north and south side of the peak, the Cotyledon and grass occurring only on the north side, while the Artemisiæ, Anabasis, and other ubiquitous desert species prevailed on the other or southern face.

Laurence caught for me on this craga locust (*Tryxalis unguiculata Linn.*), resembling exactly the withered straw-coloured twigs and sand in which he lived.

Further towards Wâdy Suweiriyeh grow *Pyrethrum santalinoides D.C.*, *Centaurea eryngoides Lam.*, *Alkanna orientalis Boiss.*, *Lithospermum tenuiflorum Linn.*, *Suæda monoica Forsk.*, *Piptatherum multiflorum Beauv*, and of rarer kinds, *Echinops glaberrimus D.C.*, *Iphiona montana Vahl.*, *I. juniperifolia Coss. Anarrhinum pubescens Fres.*, *Primula Boveana Dcne.*, and *Teucrium sinaicum Boiss.*

It was interesting to notice a form of *Cotyledon umbilicus Linn.*, the only apparently native British dicotyledon I met with in Sinai. It has been gathered here previously by Bové, according to Decaisne, who recorded it under the present name. Unfortunately my specimens are in too bad a condition to determine, consisting only of young leaves and a withered stem. The root was tuberous. It is plentiful on Mount Hor, and is not unlikely to be identical with the new form Dr. Schweinfurth gathered on mountains between the Red Sea and the Nile Valley.[1]

Retama Retem Forsk. is very common in these high-lying wâdies. It quite takes the place of acacia, and was now laden with its one-seeded capsules. It is very pretty and sweet when in flower. The varieties of *Anabasis articulata*, whose bracts wither a showy red and rich claret colour, are common here. This species is quite abnormal at this season, having shed all its more slender twigs, and having more the habit of a Zygophyllum. It was not till I reached Wâdy Arabah that it occurred in its natural form.

Lepidopterous insects were more numerous in these cooler stations, chiefly attracted by the tent lights at night. Of the earlier desert plants Reaumaria and Gymnocarpum are still abundant.

Several grasses, Cucurbitaceæ and Zygophyllaceæ belong to lower districts, but Fagonia ranges everywhere so far. *Ruta tuberculata*, with its disgusting smell, is still to be met with.

At Ain Zuweireyeh, where we camped for the ascent of Mount Sinai, there is a poor little garden containing pomegranates, palms, and nubk (Zizyphus), apricots, and mallow. Gomphocarpus is abundant about this well. It is one of the most remarkable species in Sinai.

I made the ascent of Jebel Musa and Jebel Catharine on the 20th November. On the way to the convent of Mount Sinai occurred *Centaurea scoparia Sieb.*, *Celsia parviflora Dcne.*, and *Alkanna orientalis Boiss.* At the convent garden, where we dismissed our camels, are cypress, orange,

[1] Barbey, *op. cit.*, p. 134.

figs, olives, dates, and vines in cultivation. These I only saw over the garden wall, for the delay in the convent was irksome since the whole thing was to be done in a day. On the garden gate were suspended several dead Egyptian vultures, which surprised me, as I thought the bird was too much valued as a scavenger to be destroyed. Gomphocarpus occurred again a little above the convent which stands at 5,024 feet above sea-level. The following were first met with here :—*Asperula sinaica Dcne.*, *Pulicaria crispa Forsk.*, *Verbascum sinaiticum Bth.*, *Plantago arabica Boiss.*, *Phlomis aurea Dcne.*, *Nepeta septem-crenata Ehr.*, *Mentha lavandulacea Boiss.*, *Teucrium polium L.*, var. *sinaicum.*, *Origanum maru Linn.*, *β sinaicum*, *Ficus pseudosycomorus Dcne.*, and *Adiantum capillus-veneris Linn.* A single tree stands near the spring, but I unfortunately lost my leaves of it. It was, I believe, *Salix safsaf Forsk.*

At this height, about 5,500 feet, a couple of palms (across the valley), *Phœnix dactylifera Linn.*, and a tall cypress, *Cupressus sempervirens Linn.*, var. *pyramidalis*, occur. The latter, which is not native, occurs a little higher in a conspicuous place familiar to all travellers.

Cotyledon umbilicus Linn., *Arenaria graveolens Schreb.*, *Scirpus holoschœnus Linn.*, *Peganum harmala Linn.*, *Echinops glaberrimus D.C.*, *Acanthodium spicatum Sieb.*, and several mosses were gathered on the ascent. On such occasions as these the Bedouins made wild gestures and howls as I escaped from them into gullies and up cliffs. One reason of this I found to be their horror of boots, which they think most dangerous to the climber. At the second pyramid, that of Cephren, at Cairo, where I stole a march and reached the summit alone, the Bedouins who pursued me made frantic efforts to deprive me of my boots ere the descent began. I need hardly say I valued the skin of my feet too highly to obey.

In spite of the Bedouins I followed the bent of my own botanical inclinations. The mosses were the result of a detour from the beaten track to a less open gully looking north. On or close to the summit, 7,320 feet, were *Cratægus sinaica Boiss.*, *Artemisia herba-alba Asso.*, *Verbascum sinaiticum Bth.*, *Ruta tuberculata Forsk.*, *Peganum harmala Linn.*, *Arenaria graveolens Schreb.*, *Buffonia multiceps Dcne.*, *Poa sp.* (*P. sinaitica ?*), and *Ephedra alte C. A. Mey*, and others not recognisable. The ascent to the summit from the convent occupied about two hours.

The most striking feature in the aspect of the flora of the upper parts of Jebel Musa, from the convent upwards, is the prevalence of the Labiate and Scrophulariaceous families. Several fresh species had appeared, some of these peculiar to Sinai, and others met before were very abundant here. As these orders increase, the Compositæ, abundant at intermediate heights, diminish towards the upper zone. The fern and the mosses illustrate the cooler atmosphere of the elevated region, though their immediate existence depends on the unfailing springs of water. Having left our party here I descended rapidly to the convent of Deir el Arbain, about 1,700 feet below, in the bottom of the gorge between Jebel Musa and Catharine. With a nimble Arab as guide we did this in half-an-hour. At the convent I was transferred to another native. There was barely

daylight left in which to accomplish Jebel Catharine. I had arranged that my camel should be in readiness here to bring me back to camp at Ain Zuweiriyeh at night. A quarter of an hour after my arrival the faithful Khalîl appeared, and I started at once, 1.30 P.M., for the summit.

At the monastery, or near it, were *Bupleurum linearifolium D.C.*, var. *Schimperianum Boiss.*, *Carum sp. ?*, *Pterocephalus sanctus Dcne.*, *Veronica syriaca J. & S.* (introduced), and *Celsia* and *Anarrhinum* already mentioned. *Salix safsaf Forsk.* occurs here. During the ascent most of the labiates and the hawthorn of Mount Sinai, were met with ; but this mountain wore a far more wintry aspect than its lower neighbour. A lack of running water renders it at all seasons more barren. At the spring Mayan esh Shunnâr, "fountain of the partridge," I made another little gathering of mosses, in all from the two mountains ten species, *i.e.*: *Grimmia apocarpa Linn.*, *G. leucophæa Grev.*, *Gymnostomum rupestre Schwæg.*, *G. verticillatum*, *Tortula inermis Mont.*, *Eucalypta vulgaris Hedw.*, *Entosthodon templetoni Schwæg.*, *Bryum turbinatum Hedw.*, *Hypnum velutinum Linn.*, *H. ruscifolium Neck.* These are all British species with the exception of *Tortula inermis*, which occurs also on the Morocco mountain at 8,000 to 10,000 feet, and no doubt elsewhere round the Mediterranean. One only in the list, *Gymnostomum rupestre*, is sub-alpine in Great Britain. There are two other mosses also common British species recorded from Mount Sinai by Decaisne.

The remainder of the ascent was over barren and perfectly unvegetated rock. Nevertheless, within a few hundred feet of the summit I was rewarded by finding the exquisite little *Colchicum Steveni ? Kth.*, of a delicate pale lilac colour, sometimes white. It had no leaves, and bore either one, two, or three flowers on the scape ; usually only one. It occurred again on the extreme summit, and I secured several bulbs. *Colchicum Steveni* was gathered afterwards on Mount Hor, where the flowers were very decidedly smaller. The Jebel Catharine plant may prove to be specifically distinct. This Colchicum has been recorded from the Palestine coast as far south as Joppa.

On the summit there was hardly any life. I obtained *Buffonia multiceps Dcne.*, *Arenaria graveolens Sch.*, *Herniaria sp.?* (*H. hemistemon?*), *Gypsophila hirsuta Led.*, and *G. alpina Boiss.*, and fragments of an Astragal, perhaps *A. echinus D.C.* On the ascent I gathered the root and leaves of a sedge looking like *C. distans Linn.*

The summit of Jebel Catharine, 8,536 feet, the highest in the peninsula, was very cold, barely above freezing point. Its mean annual temperature would perhaps about correspond with that of Edinburgh, while Jebel Musa would be nearer that of London. It is a solid hump of syenite with a lower shoulder joining it to a similar prominence about half a mile away. The view was magnificent, including the whole coast-line of Sinai from Suez to Akaba, except the portion intercepted by the Umm Shaumer range to the south, whose summit almost equals that of Jebel Catharine. Jebel Musa looks a mere trifle, one of a fierce sea of red pointed and serrated peaks and ridges.

The summit was reached at 3.15, left at 4, and the convent of Deir el Arbain regained at 5. A long camel ride through a wild gorge by moonlight brought a memorable day to a close.

In the gorge I heard a deep clear strange note which my Bedouin called "hōadoō." It seemed to proceed from an owl, and may have been Bubo ascalephus, the Egyptian eagle owl, but, much as my curiosity was aroused, there was no means of gratifying it.

With the exception of a couple of chats (*Saxicola leucopygia Br.* and *S. lugens Licht.*), and the Egyptian vulture, no birds were seen. A single coney (*Hyrax Syriacus H. & Ehr.*) showed himself for a few seconds on the summit of Jebel Musa.

CHAPTER IV.

Mount Sinai to Akaba.

Our journeyings from Mount Sinai lay east of north to Akaba, skirting and occasionally crossing corners of the Tîh plateau.

Hares were occasionally seen of the little long-eared Sinaitic kind, and gazelle tracks were very numerous in Wâdy Zelegah (Zolakah). The lizards already mentioned are plentiful in this wâdy, and several geckos were captured, which proved to be of two species. A snake, *Zamenis ventrimaculatus*, was safely lodged in my spirit cylinder.

Wâdy Zelegah is a noble valley plain about half a mile wide for upwards of twenty miles, bounded by precipitous cliffs and mountains. Several detours were made into the Tîh cliffs on the left of our line of march. The chief plants were—*Glaucium arabicum Fres.*, *Capparis galeata Fres.*, *Cleome arabica Linn.*, *Ruta tuberculata Forsk.*, *Odontospermum graveolens S. Bip.*, *Artemisia herba-alba Asso.*, and vars., *Sonchus spinosus Forsk.*, *Verbascum sinaiticum Bth.*, and for the first time *Moricandia dumosa Boiss.*, *Capparis spinosa Linn.*, *Iphiona scabra Del.*, and *Imperata cylindrica Beauv.*

Frequent bags of fossils were obtained *in situ* for the assistance of the Geological Survey.

In birds, the white wagtail and the little cock-tailed wren-like warbler (Drymœca) are the most frequent. Desert larks and shrikes also occur at scattered intervals. A very small warbler, *Sylvia nana*, was shot amongst tamarisk bushes. The song of the Drymœca is quite wren-like, but less piercing.

The flora is that of the western side; Tamarix, Caylusea, Retama, Ochradenus, Zilla, Santolina, Artemisia, Ærua, Ballota, Stachys, Lavandula, Anabasis, of species already mentioned, predominate. Several of the Mount Sinai groups of labiates are for the present missing, as also are two or three of the Iphiona group of composites. The larger Capparis is very frequent, growing on the most arid rocks above the wâdy flats, where nothing else, except perhaps *Lavandula coronopifolia Poir.*, appears able to

exist. *Capparis galeata* is sometimes an erect shrub 6 or 8 feet high, of a bright green, differing from the slender trailing blue-foliaged species, C. spinosa, which often grows with it. The former is now in fruit, the latter barren.

Camels delight in the larger grasses, in Ochradenus, Zilla, Nitraria, Anabasis, and tamarisks.

At the head of Wâdy Elain, a grove of tamarisks was plentifully indued with an excrescence or exudation of greyish-white pillules of a viscid substance, with a faint taste of nucatine. This is the so-called "manna of Sinai," which is, I believe, more plentifully obtained from *Alhagi maurorum D.C.* This gum is said to be due to the puncture of a small insect.

Life became more plentiful. Three butterflies were observed: a pale blue, a sulphur-yellow with brown under wings, and an admiral. Hornets and a long-bodied insect darted about in a broiling sun. I obtained all these except the sulphur-yellow butterfly.

In plants *Suæda monoica Fres.*, and for the first time the rare *Linaria macilenta Dcne.* This spring species was in flower, but the fugaceous corolla falls at the slightest touch. *Cleome droserifolia Del.* was also here first obtained. A spring supported a stream that moistened the soil for about a mile ere it gradually died a natural death. It led us the way into an unexpected and magnificent fissure in the red granite, the Wâdy Elain. For five or six miles the gorge passes between sheer cliffs of this richly coloured rock, with a height varying from 500 to 800 feet, and from 10 to 50 yards wide. It is in some ways the most impressive natural feature I have ever beheld. The floor is hard and level, and as the sun rarely hits the base of the cleft, many plants remained here in a fresher condition than elsewhere, and some new varieties were found. I will mention the less common species procured in this remarkable sîk, or cleft, which has rarely been visited: *Moricandia sinaica Boiss, M. dumosa Boiss, Cleome droserifolia Del., Capparis galeata Fres., Abutilon fruticosum G. & P., Zygophyllum coccineum Linn., Tephrosia purpurea Pers., Pulicaria (Francœuria) crispa Forsk., Blumea (Erigeron) Bovei D.C., Iphiona scabra Del., Sonchus (Microrhynchus) nudicaulis Linn., Scrophularia deserti Del., Linaria macilenta Dcne., Lycium arabicum Schw., Hyoscyamus aureus Linn., H. muticum Linn., Ballota Schimperiana Bth., Teucrium sinaicum Boiss., Origanum maru Linn., β Sinaicum Boiss., Atriplex leucoclada Boiss., Typha angustata B. & C., Cyperus lævigatus Linn., et var. junciformis Panicum turgidum Forsk., Pennisetum dichotomum Del., Imperata cylindrica Beauv.*, and forms of *Reseda pruinosa Del., Fagonia cretica L.*, as well as other indeterminable remains. Several of the above are peculiar to Sinai, and some mentioned here and elsewhere are now first included in its flora.

It was with misgivings we camped in this wâdy. Had a "seil" like the Rev. F. Holland's memorable one at Feiran visited us, we would have assuredly had a bad time. But the expected rain did not yet arrive.

While we were encamped here we received notice of the arrival of

visitors for whom our ever courteous chief prepared coffee. The party, consisting of engineers, Colonel Colvile, I believe, and others, passed us at speed on the opposite side of the narrow valley without a greeting. Suspecting that this impetuous haste, and absence of that courtesy for which Englishmen on their travels are so justly famous, arose from ulterior motives, Professor Hull summoned a council of war, which resulted in despatching our able conductor, Bernard Heilpern, with orders to secure our entitled priority to the Akaba Sheikh's camels and services. Bernard passed the fugitives in the night, and was entirely successful.

It was long ere we got clear of this ever widening, slowly rising Wâdy el Tihyeh, which wound through granite hills and lifted us out of Wâdy Elain. Our height above sea-level varied between 2,500 and 3,000 feet. Acacias are numerous, chiefly *A. seyal*. This small tree, when not too flat-topped, as is commonly the case, has at a little distance a close resemblance to our hawthorn, with its gnarled and twisted stem and rugged bark. The granite hills, usually capped with a stratum of sandstone, are barren in the extreme. Dæmia cordata and Tephrosia purpurea are the only noteworthy species.

Hey's sand partridges are frequent, and good to eat. All seen as yet are of the one species. They rarely fly until almost walked on, trusting for escape to their close resemblance in colour to the shingle and rocks they inhabit. Until they run, which they do with rapidity, they would be most difficult to observe. Nevertheless they often betray themselves by their sharp cry of alarm. The Bedouin then, swift, stealthy, and bare-footed, gets easily amongst them, for they seem more alarmed by a noise than by the human figure. The Bedouin flint lock is, however, slow and dignified in its performance, and usually affords abundant time for escape from its uncertain discharge.

Rock-pigeons and martins (*Columba Schimperi Bp.*, *Cotyle rupestris Scop.*) were seen in Wâdy Elain.

All about the caper is frequent. The Arabs eat the ripe red fruit and seeds. I tasted it but did not continue to eat it. The skin is like mustard, and the seeds like black pepper.

In a marshy place at the head of Wâdy Elain, amongst palms and tamarisks, Typha angustata was 12 to 14 feet high ; Erigeron Bovei 6 or 7 feet high, well branched and with many flowers, and Phragmites gigantea was fully 15 feet high.

The pricklier plants, Acacias, Acanthodium, Gymnocarpum, &c., are commoner in a general sense on the granite and sandstone than on the limestone.

In a very dirty well, Bir es Sowrah, near the base of Jebel Aradeh, *Chara hispida Linn.* occurred, and with it *Juncus maritimus Lam.*, *β arabicus*, palms and capers.

On the summit of Jebel Aradeh there was no vegetation, and in the limestone now lying above the sandstone numerous cretaceous fossils were obtained. A single white butterfly (Pieris sp.) was the only living thing. I estimated the height of this mountain 3,400 feet. It is about 1,300 feet

above the plain, and forms a most conspicuous object. Like others, except those of granite, in this region, it is crumbling away and turning to dust on all sides. The beds of chalk and flints are much disintegrated, while all the outer surface of the lower limestone is on the move.

The only plants were Gymnocarpum, Reaumuria, Capparis, Acanthodium, and Lavandula of the usual kinds.

We are here in a little known and unsurveyed region. Consequently there is abundant work for the engineering section of our party. Very few travellers have passed this way since Laborde's time, and I was sorely disappointed to find on the tableland we were now entering there was little living vegetation, although abundant withered evidence of a sparse but varied flora.

This tableland is called here Jebel Hirteh, and is, properly speaking, a portion of the Tîh plateau which becomes indefinite at its south-eastern border. A fine oval plain, Wâdy Hessih, about three to five miles broad, literally abounded in lizards, and here I killed another Zamenis, a sand-coloured snake about 4 feet long. A large-headed Arachnid (Sparacis sp.) is also very abundant, and seems to form food for some of the numerous chats and larks. Small flocks of sparrows, *Passer hispaniolensis Temn.*, occurred here, while there is usually a raven or a vulture in sight.

This wâdy, now clad with withered scraps, is a favourite pasturing place later on for the Bedouins' flocks. I gathered here *Tribulus a'atus D.C.*, *Anastatica hierochuntina Linn.*, *Zygophyllum dumosum Boiss.*, *Lotus lanuginosus Linn.*, *Ifloga spicata Forsk.*, *Filago prostrata Parlat.*, *Linaria floribunda Boiss.*, *Verbascum sinuatum Linn.*, *Heliotropium undulatum Vahl.*, *Micromeria myrtifolia Boiss.*, *Plantago ovata Forsk.*, *Panicum Teneriffæ R. Br.*, and *Aristida cærulescens Desf.* These had not been previously met with. Other interesting species not recently seen were *Farsetia ægyptiaca Turr.*, *Reseda pruinosa Turr.*, *Polycarpæa prostrata Dcne.*, *Heliunthemum Lippii Pers.*, *Atractylis flava Desf.*, *Zygophyllum album Linn.*, and others of commoner sorts.

In these depressions of the plateau, where water and soil are of more frequent occurrence, there is an abundance of greyish scrub, short, thin and interrupted, and composed chiefly of Zygophyllum dumosum, Anabasis (Salsola), Articulata, Ephedra alte and Atriplices, Nitraria, Zilla, Retem, and sometimes tamarisk.

Sonchus nudicaulis Linn., *Dæmia cordata Br.*, Gomphocarpus and Lindenbergia still occur.

I endeavoured to obtain the Arabic names of the commoner species, and to confirm them from the mouths of two or more Bedouins. These names so obtained rarely agree with those I find quoted in Forskahl, Boissier, Tristram, and others. It is probable that every tribe has its own plant-names.

An Arab informs me that "boothum," a tree growing on Jebel Serbal and nowhere else, with a stony fruit, is used, its leaves being boiled as a cure for rheumatism, an infirmity to which the Arabs are martyrs. I suspect the plant to be *Cratægus aronia*. Also that safsaf (*Salix safsaf Forsk.* or

Populus euphratica Linn.) is the wood in demand for charcoal to colour their gunpowder. This they obtain in the valley between Jebel Musa and Jebel Catharine as well as on the latter mountain. The proportions of their gunpowder are—one part sulphur, four parts saltpetre, and a little charcoal to colour.

Anastatica hierochuntina Linn., "Kaf Maryam," or Rose of Jericho, was first seen here, and becomes common to Akaba and northwards to the Ghôr es Safieh. Ephedra alte is the most characteristic and abundant species. Acacias are almost absent. We are on a limestone tableland with occasional outcrops of sandstone. Once on such an outcrop a single shrub of Acacia seyal occurred. In exposed situations these acacia bushes, formed like a table with its single leg much nearer one side than the middle, point with their overhanging part in the direction of the prevailing wind. On reaching the granite pass into Akaba the acacias again become abundant, but their absence above may be partly explained by the exposed situation.

Camels eat even the milky asclepiads, as Dæmia, which is said to be highly poisonous. *Heliotropium arbainense Fres.* was first met with by the Haj route from Cairo to Akaba, which we were now close to.

Those two especially nauseous species, Peganum and Ruta, are very frequent. The smell of the former is like that of our hound's tongue, the latter reminded me of some kind of wood-bug, which I collected in an evil moment in the scaffolding of the Milan Cathedral. *Cleome droserifolia Del.* smells like a fox. Other species here are *Malva rotundifolia Linn.*, *Linaria macilenta Dcne.*, *Deverra tortuosa Gœrtn.*, and *Ærua javanica Juss.*

On the 29th November we descended a magnificent gorge between granite and limestone by the Haj road to Akaba, which takes its name (Akaba, "steep descent") from this entrance. The ever varying peeps of the gorgeously blue gulf of Akaba shining in an intense sunlight were a most refreshing change from the desert. The rich purple colouring of the lofty mountains of Midian formed a noble background.

CHAPTER V.

Akaba.

At Akaba we remained from November 29th to December 8th. I increased my collection here considerably. The flora displayed several fresh species. Bird life was more plentiful, and a large collection of shells was made on the beach. These, consisting of upwards of 200 species, including those from Suez, I have had determined by Mr. G. B. Sowerby, and amongst them are many which do not appear to have been admitted as inhabitants of the Red Sea.

Akaba, even at this season, was oppressively hot. A swim in the sea, or rather a crawl amongst the coral reefs, about 3 feet below the surface, was delightful. Farther out sharks abound.

The straggling Arab village lies at the south-eastern corner of the

plain which forms at once the head of the gulf and the southern end of the Wâdy Araba. This is the narrowest part of the wâdy, being not more than five or six miles across.

A very fine tree of *Acacia tortilis Hayne* stands close by. On the coast are many clumps of the date palm, interspersed with a very few trees of the doum palm (*Hyphæne thebaica Del.*), already noticed here by Mr. Redhead. The doum palm, a native of tropical Africa, Nubia, and Abyssinia, finds its northern limit at Akaba.

In the enclosures here I noticed nubk (Zizyphus), henna (Lawsonia), palms, tamarinds (*Tamarindus indica L.*), pudding pipe (*Cassia fistula?*), figs, and several kinds of gourds. Most esculents were still invisible or in a seedling state.

There is but one boat at Akaba. Laurence and I succeeded in hiring this with a native fisherman, with two Arabs, nets and lines. There were many flying fish (Exocœtus) about. We first rowed across the corner of the gulf and landed on the sandy beach, where the two Arabs landed and with a circular casting net captured some small fish ("Akadi" and "Sahadan") for bait. With these and some loose stones, about a pound weight each, we rowed out a few miles. The bait fish, broken in three, is affixed to the hook and one of these stones is hitched to the line a little above with a slip-knot. On reaching the bottom a couple of violent jerks dismiss the sinker and let the line swing free. We caught fish rapidly, "hedjib," at Suez called "jar," "gamar" (a species of Chætodon?), and one splendid red fish they called "bossiah," without scales, and very good to eat. We also hooked a shark, "Zitani," about 5 feet long, who amused us for a time and then carried off the line.

Before dismissing our Towarah Bedouins I had endeavoured to pump them of what little information they possessed about the feral inhabitants of Sinai. They knew of leopards on Serbal and Umm Shaumer; wolves in Wâdy Lebweh and neighbourhood; hyænas, ibexes, gazelles, hares, jerboas, rats, and mice made up their total. Their sheep they say were imported from Arabia; they have a few donkeys and camels; their goats are a distinct breed which they are especially proud of. Five kinds of snakes they admitted, all of which were poisonous! The one I caught in Wâdy Zelegah, *Zamenis ventrimaculatus*, attains a full size of 5 or 6 feet. These remarks I set down to be taken for what they are worth.

Dr. Hull captured a handsome little snake here, and handed it over to me; it proved to be *Zamenis elegantissimus*, and is now in the British Museum.

The birds obtained at Akaba were—*Cercomela melanura Temn.*, *Cyanecula cærulescens Pall.*, *Argya squamiceps Rupp.*, *Motacilla alba Linn.*, *M. flava Linn.*, *Pycnonotus xanthopygus Hemp. & Ehr.*, *Lanius fallax Finsch.*, *Passer hispaniolensis Temn.*, *Ægialitis asiatica Pall.*, *Tringoides hypoleucos Linn.*, and several larks and chats already mentioned. Ravens, crows, martins, rock-pigeons and the little gull, *Larus minutus L.*, were also observed. Vultures and English swallows were frequently to be seen, the former usually of the Egyptian species.

Not many identifiable plants occurred here which had not been previously seen. These are—*Cassia acutifolia D.C.*, *C. obovata Coll.*, *Onobrychis Ptolemaica Del.*, *Tephrosia apollinea Del.*, *Artemisia monosperma Del.*, *Statice pruinosa Linn.*, *Salvia deserti Dcne.*, *Boerhavia plumbaginea Cav.*, *Calligonum comosum L'Her.*, *Atriplex crystallina Ehr.*, and *Andropogon foveolatus Del.* A few other less common species may also be mentioned:—*Lotononis Leobordea Linn.*, *Tephrosia purpurea Pers.*, *Sonchus spinosus D.C.*, *Cucumis prophetarum Linn.*, *Linaria macilenta Dcne.*, *Trichodesma africanum*, *R. Br.*, *Heliotropium arbainense Fres.* Forskahlea, Andrachne, Panicum, and others. Along the shore in some places is a close growth of *Nitrara tridentata*, *Atriplex leucoclada Boiss.*, *A. halimus Linn.*, *Juncus maritimus Linn.*, var. *arabica* and others. *Cressa cretica* is a characteristic species along the shore on the saline flats.

Gathering shells where such an abundance of, to me, novel forms occurred was enthusiastically pursued. I shall not here deal with this subject in any detail, but merely mention the principal genera met with. These were mostly univalves, bivalves being scarcer in species, and infinitely fewer in individuals. Great numbers of opercula of a Turbo, pretty polished little hemispherical bodies retaining the spiral lines of structure, pens of calamaries, and the delicate vitreous wingshells of pteropods occurred, as well as a large variety of fragments of coral. Conus, Cerithium, Strombus, Cypræa, Mitra, Triton amongst univalves; Arca, Pectunculus, Tridacna, Chama, and Venus amongst bivalves, were the best represented genera. Drift shells are rarely disturbed, the tide being apparently not above a foot in range at Akaba.

CHAPTER VI.

Akaba to Mount Hor.

At Akaba we have left the Sinaitic peninsula; from here we turned northwards up the Wâdy Arabah. Happily we had occasion henceforth to travel more slowly, in order to give the surveying party time to keep pace with us. I was thus enabled to make wide detours east and west out of the Arabah, but my inclination lay chiefly eastwards into the precipitous borderland of Edom.

In the Wâdy Arabah I saw gazelles several times; Wâdy Menaiyeh, on the west, may be mentioned as a good hunting ground. These graceful animals seemed more at home on the west side, abounding on the Judæan wilderness, and all over the Tîh plateau. Ibexes, on the other hand, appeared more frequently on the higher mountain declivities of Edom to the east. Hyænas, judging from their tracks, must be plentiful; once I had a good view of one, and quickened his lolloping pace with a fusilade from revolver and fowling-piece. At El Taba, on the east side, about twenty-five miles north of Akaba, a fruitful, marshy place with a deep

spring, I saw perfectly fresh tracks of "nimr," or leopard, and subsequently, at Ain Abuweirideh, Laurence came on fresh remains of some beast which had served apparently a meal for these animals. A hare, the Sinaitic species, was killed a few miles north of Akaba. A much larger hare, *L. ægyptiacus*, was seen several times on the eastern declivity of the Tîh. My frequent failure in bringing down game and specimens I attributed partly to my having been unable to land English cartridges or powder in Egypt, and being dependent on very worthless and very expensive ones procured in Cairo. I would recommend all sporting travellers to run any risk in smuggling sooner than let this occur to them.

The Wâdy Arabah abounds in rodents. These animals appear to be chiefly nocturnal in their habits, and are very seldom seen. The number of holes and the abundance of their tracks is truly astonishing. Their colours are usually in strict harmony with the desert, for the Wâdy Arabah is some ten to thirteen miles across, and more correctly called a desert than most parts of Sinai. Jerboas were seen a few times, and Gerbilles, of which I trapped one, appear to be most numerous.

Birds have increased in numbers and variety. From El Taba northwards, about twenty-five miles from Akaba, a grove of acacias (chiefly *A. tortilis Hayne*), and a little Zizyphus, stretches about ten miles along the eastern edge of the Arabah. A smaller grove occurs nearer Akaba at the mouth of Wâdy el Ithm, where I first met with the "hopping-thrush." In the larger grove the handsome *Loranthus acaciæ Zucc.* abounds.

Several times I endeavoured to get a shot at a small bird here which uttered a sharp little note, new to me, but I was unsuccessful. Mr. Armstrong, who was with me that day, and is well skilled in Palestine birds, recognised it, having also seen the bird, as the little Sunbird, *Cinnyris Oseæ*. Subsequently, when I reached the Ghôr, I obtained several specimens and recognised the note at once. This species has not been detected south of the Ghôr, where it was first made known, like the hopping-thrush, by Canon Tristram.

The Sunbird probably follows the Loranthus, to whose flowers it appears attached. Its long bill reaches the base of the tubular flower, searching for honey, and it thus probably secures their cross-fertilization. One was shot in the Ghôr in the act of doing so, its bill being covered with the pollen of the Loranthus.[1]

The hopping-thrush (*Argya Squamiceps*) is a remarkably weak flier, hardly leaving the ground except in tremendous jumps, which cause his large fan-shaped tail to overbalance and almost overturn him as he makes a pause. He is a most grotesque bird; nevertheless the mournful cries of one when I had shot his mate impressed me with a different feeling.

Palestine bulbuls were occasionally seen here also. Hooded chats,

[1] Since writing the above I find that Burton has seen the Sunbird, almost certainly this species, about five degrees from this southwards, in Midian. "Land of Midian," vol. ii.

Persian larks, and desert larks were frequent, and large flocks of sparrows assembled about us in several places.

The floor of the wâdy is sometimes alive with geckos, lizards, and ants, as well as numbers of long-winged males of a Persian species of white ant, *Hoeotermes vagans Hag.*, not yet able to fly, over which the hopping-thrushes fall into inconceivable excitement.

The first bee I met with was captured here, and small beetles are often sacrificed to the good of science. I spare the reader the enumeration of their scientific names, which will be given fully at the close.

At El Tabah occurred a greensward of *Cynodon dactylon Linn.* In or near the grove already spoken of were *Cocculas Leœba, D.C., Fagonia myriacantha Boiss., Scrophularia deserti Del., Loranthus acaciæ Zucc., Salsola fœtida Forsk., Eragrostis cynosuroides Retz.*, and commoner sorts. In the open sandier wâdy, *Glaucium arabicum Fres. Gypsophila Rokejeka Del., Monsonia nivea Dcne., Microrhynchus nudicaulis, Linn., Iphiona scabra Del., Citrullus colocynthis, Schr., Cleome droserifolia Del.*, Cucumis, Pancratium, Danthonia, Trichodesma, Andrachne, Forskahlea, Anabasis, and Tamarisk form almost the whole vegetation.

In some places the wâdy is spanned by rolling wastes of sand dunes 10 to 12 feet high. These appear to have been formed around the bases of clumps of tamarisk and anabasis, which is here very tall, 6 to 8 feet high or more.

Ochradenus baccatus is very abundant, often overtopping the acacias by whose protection from camels it thrives. Lycium europæum and one or two grasses escape being cropped in the same manner, and grow to an unwonted size.

On the 7th December a long day's climbing with Laurence brought us to the head of Wâdy Ghurundel in Edom. This was at a height of about 1,800 feet above sea-level, six miles east from the Arabah. The scenery on the way was superb. Huge blocks of red sandstone, 800 to 1,000 feet high, towered above us, sometimes sheer and tottering in broken masses from the main cliffs behind. We passed a spring with a few date-palms, and a little higher a large bulb with broad leaves (*Urginea scilla Steinh ?*) first appeared and soon became abundant. It was not yet in flower. *Dianthus multipunctatus Ser., Eryngium sp., Odontospermum pygmœus Cav., Cotula cinerea Del., Solanum nigrum Linn.* (var. *moschatum*), *Satureia cuneifolia Ten., forma, Boerhavea verticillata Desf., Ficus sycamorus Linn., Traganum nudatum Del., Aristida ciliata Desf.*, appeared for the first time. The Odontospermum (*Astericus*), which occurred at a considerable height, was a little woody button representing the hardened flower head, which was usually solitary and close to the ground. This plant, like Anastatica, has hygrometric properties, and has been put forward by Michon as the true Rose of Jericho of the travellers of the middle ages. *Anastatica hierochuntina* will not, however, be readily deprived of its claims.

Besides the above, which were all gathered farther on, some plants of more limited range occurred : *Moricandia dumosa Boiss., Abutilon*

fruticosum G. & P., *Varthamia montana Vahl.*, *Iphiona scabra Del.*, *Centaurea scoparia Sieb.*, *Iphiona juniperifolia Coss.*, *Ballota undulata Fres.*, and others already met with.

Judging from the abundance of its bur-like carpels lying in the dry watercourses, Calligonum comosum is the most abundant shrub ; it is now in a withered condition. Several other bulbous species which occurred here are as yet undetermined. A stiff scramble brought me back to the Arabah by a more northern valley. Amongst land shells, helices of four species were gathered in Wâdy Ghurundel.

CHAPTER VII.

Petra and Mount Hor ; Wâdies Haroun (Abou Kosheibeh), and Musa ; Jebel Abou Kosheibeh.

The last valley has shown us some characteristic Sinaitic species extending their range north-eastwards across the great valley of the Arabah. Several more will appear in the group of localities now to be considered. Were I to hazard a suggestion here, it would be that these plants, formerly considered peculiar to Sinai, have had their origin more eastwards, and have spread, like many other Arabian plants, in a westerly direction.

Owing to the greater moisture found in the upper part of some of the valleys of the Edomitic escarpment, there is a greater variety of species and a sprinkling of ferns, mosses, and lichens. These are mostly more northern forms, spreading southwards at high levels.

We are now entering a district which Canon Tristram has somewhat liberally included in Palestine. The flora has its own peculiar plants as well as a large proportion of southern or Sinaitic species, and thus it adds many to the Palestine flora. I will first speak of the wâdies, and then of Mount Hor and Petra. The latter places, I think, have not been botanised previously to my visit, and are visited only with difficulty and expense, owing to the cupidity and lawlessness of the sturdy beggars or Bedouins who dwell there.

Irby and Mangles, Commanders in the Royal Navy, travelling in 1816–1820, were the first Europeans who visited these regions in modern times. Further on I will quote a few remarks from their most interesting volume, since I find no other allusions to the vegetation of the ancient capital of the Nabathæans.

The following plants not previously seen were gathered in Wâdy Abou Kosheibeh (Wâdy Haroun), and on the Jebel or peaked mountain which stands in a commanding position across its head :—*Fumaria micrantha Lag.*, *Erodium hirtum Forsk.*, *Poterium verrucosum ? Ehr.*, *Anvillæa Garcini D.C.*, *Carthamus glauca M.B.*, *C. lanatus Linn.*, *G. arabica*, *J. & S. Podonosma syriaca Lab.*, *Nerium Oleander Linn.*, *Pentatropus spiralis*, *Forsk.*, *Boucerosia*, *sp. nov.?*, *Salvia ægyptiaca Linn.*, *Juniperus phœnicea*,

Linn., *Bellevallia flexuosa Boiss.*, *Asparagus aphyllus Linn.*, *Asphodelus ramosus Linn.*, *Pennisetum cenchroides Rich.*, *Cheilanthes odora Sw.*, and *Notholæna lanuginsa*, *Desf.* Of these, Globularia, Podonosma, Boucerosia, Juniperus, and the two ferns were obtained above the wâdy amongst the cliffs of Jebel Abou Kosheibeh, from about 3,000 to 3,500 feet above sea-level.

The Globularia is a pretty compact little shrub, with blue heads of flowers and small entire leaves; the species here is the Arabian form, *G. arabica*, perhaps hardly distinct from *G. alypum L.* of the Mediterranean.

The two Asclepiads, Boucerosia and Pentatropis, are both frequent; the latter is probably *P. spiralis*, but as it was not in flower, Mr. Oliver would not speak positively. It occurred again at the Ghôr, trailing over acacias.

The Boucerosia may be *B. aucheriana Dcne.*, an insufficiently described plant from Muscat in South-East Arabia, which is also the nearest known habitat for the Pentratropis.

On Jebel Abou Kosheibeh were also gathered—*Moricandia dumosa Boiss.*, *Gomphocarpus sinaiticus Boiss.*, *Helianthemum Lippii Pers.*, *Cotyledon umbilicus ? Linn.*, *Linaria macilenta Dcne.*, *Verbascum sinuatum Linn.*, *Phlomis aurea Dcne.*, and *Boerhavea verticillata*, *Poir.*

Many desert species of Reaumuria, Ochradenus, Zygophyllum, Morettia, Zilla, Acacia, Retama, Ruta, Ifloga, Lycium, Trichodesma, Forskahlea, Asphodelus, Anabasis, Ephedra, and grasses already mentioned, occur also in Wâdy Haroun, the name which the Bedouins invariably give this wâdy.

It will thus be seen that there is no appreciable break as yet in the continuity of the Sinaitic flora as we travel up the Wâdy Arabah, but an increase of species from eastwards and northwards.

The Wâdy Haroun is at first wide and arid, but after a few miles vegetation rapidly increases with moister conditions. The flanks of the Edomitic limestone plateau are better supplied with moisture than the Sinaitic granite. Banks by the edge of this valley at a moderate elevation, 1,000 to 1,500 feet above sea-level, had a sparse coating of mosses and other cryptogams. The mosses were chiefly of the Tortula genus, of which five species were collected. Side by side with these grow the desert species above mentioned in great luxuriance. Demia cordata, for instance, climbed to a height of 10 or 12 feet in retem bushes; the support being as well developed as the climbing plant. In the open desert, Dæmia, as mentioned by Mr. Redhead, lies sprawling on the ground, its several stems sometimes closely twisted into a thong towards their extremity, so that all circulation is stopped, and the young shoots are strangled. This is probably due to changed conditions having deprived it of its normal support, which it rarely finds in the desert, and even seems there to have lost the power of utilising. For I have seen it strangling itself side by side with bushes of the very sort which here gave it so much assistance. The desert plant was more plentifully milky, and

we have here seen at work agencies which are giving rise to a modified form, in better harmony with its environment.

From the summit of Jebel Abou Kosheibeh, which I climbed with Dr. Hull, an unusual sight was observed: a stream, small in size, but containing a good body of water, rushing down the cliffs about half a mile to the south-eastward. I could distinguish with my spy-glass the growth of arundos and oleanders that fringed its banks, but unfortunately there was no time to examine it more closely. Running water was once seen before on Jebel Musa.

The juniper is a well-shaped bush or small tree, with a trunk sometimes a foot in diameter. It gives a considerable area of shade with its dark close foliage. A large specimen occurs immediately below the summit, and I could see it on all the highlands around, even at the summit of Mount Hor, which looked but a little distance off.

On the 10th of December we made the ascent of Mount Hor, returning to camp the same day by Petra. Our camp was fixed near the mouth of Wâdy Haroun. Although having made an early start (4 A.M.), the visit was necessarily a very hurried one. While waiting for a cloud to lift from the summit of Mount Hor for the benefit of the theodolite party, I had time, however, to make a good gathering of the bulbous plants, now just showing their leaves, with which the upper part of this mountain abounds.

The view from Mount Hor, whose height I estimated by aneroid at 4,400 feet, is a disappointing one, and bears no sort of comparison with those from the Sinai peaks. This defect is due to the adjoining high and monotonous tableland of Edom, which obscures one side of the horizon. This tableland averages perhaps 5,000 feet in height in the eastern neighbourhood of Mount Hor, and is composed of the unvarying and unpicturesque white cretaceous limestone. It lowers northwards, and I afterwards reached its outer edge. In some places it has quite a forest of vegetation.

With regard to Mount Hor, Irby and Mangles write: "Much juniper grows on the mountain, almost to the very summit, and many flowering plants, which we had not observed elsewhere; most of them are thorny and some are very beautiful."

As Mount Sinai is a mountain of labiates, so Mount Hor is a mountain of bulbs. The number of species and individuals of these orders respectively vividly coloured my impression of the botanical features of each of these sacred peaks. At the same time many of the Mount Sinai plants, labiates included, occur on Mount Hor. On Mount Sinai I procured bulbs of a single species, a total of three perhaps occurring. On Mount Hor I gathered at least twenty sorts.

In the upper 1,000 feet of Mount Hor a considerable accession of Mediterranean or more northern forms appear. A more interesting group is that of plants which have been considered absolutely peculiar to Sinai. Both these lists, which I here append, would no doubt be swelled by observations at a more seasonable visit.

Northern species ranging south to Mount Hor :—

Dianthus multipunctatus Ser.
?Geranium tuberosum Linn.
Pistacia palæstina Boiss.
Rhamnus punctata Boiss., var., barren (sp. nov. ?).
Paronychia argentea Lam.
Bryonia syriaca Boiss.
Galium canum Reg.
Scrophularia heterophylla Willd.
Sternbergia macrantha Gay.
Colchicum montanum Linn.
C. Steveni Kunth. (also on Mount Sinai).
Urginea scilla Sternh.
Bellevalia flexuosa Boiss.
Asphodelus fistulosa Linn.
Asparagus aphyllus Linn.
A. acutifolius Linn.
Arum, sp.?
Carex stenophylla Vahl.

No doubt many of these occur on the Edomitic plateau, whose botany is practically unknown.

Sinaitic species discovered on Mount Hor :—

Moricandia dumosa Boiss.
Pterocephalus sanctus Dcne.
Echinops glaberrinus D.C.
Varthamia montana Vahl.
Celsia parviflora Dcne.
Origanum maru Linn., β sinaicum.
Phlomis aurea Dcne.
Teucrium sinaicum Boiss.

These have been considered peculiar to Sinai. They may now be included in the flora of Palestine.

A consideration of the latter group is especially interesting when considering the ancestral origin of the more local or endemic portion of the Sinai flora ; and it also gives us a slight clue to the probable nature of the flora of the little known region east and south-east of Mount Hor. Judging from an appendix of species of plants collected by Burton's expedition to "The Land of Midian," the flora of the upper regions of Sinai is more nearly allied to that of Edom to the north of east, than to that of Midian in the south-east. The Gulf of Akaba has formed a barrier in the latter case.

Of the bulbous species, here as elsewhere, I can only enumerate a portion. The bulk of those gathered were in leaf, and were brought home to Mr. Burbidge, of the College Botanic Gardens in Dublin, under whose care many are now growing, but have not flowered.

The arboreal vegetation of Mount Hor was confined to the summit, and consisted of a bladder-senna, *Colutea aleppica Lam.*, a turpentine tree, *Pistacia palæstina Boiss.*, and a juniper, *Juniperus phœnicea Linn.* Each of these was about 10 or 12 feet high. The Rhamnus already mentioned was very much stunted.

At Petra two new species were discovered, which will be described in another place. One was a Galium allied to *G. jungermanniodes Boiss.*, and pronounced new by Mons. Boissier. It is a low straggling matted species, with the habit of our Asperula cynanchica. It occurred in the "Sîk." The other new species was a Daphne, an erect shrub 6 or 7 feet high, with long linear leaves, reddish-brown berries, and small cream-coloured flowers. The fibre is remarkably stringy and tough. The Daphne is allied to *D. acuminata* and *D. mucronata*, but differs materially from both these species. It occurred, in flower and fruit, on the slopes of Mount Hor, about a mile from Petra, and again at intervals lower down. The Boucerosia, already mentioned as being perhaps an undescribed species, was found on Mount Hor in flower in several places.

Many unrecognisable fragments of Umbellifers, scrophulariaceous plants, grasses, and others were noticed at Petra, and the botany will yield a good harvest to any one arriving at a proper season, and with sufficient leisure. My time in Petra was somewhat under an hour!

The following plants not previously met with, were gathered at Petra and Mount Hor:—*Diplotaxis pendula D.C. Ononis vaginalis Vahl.*, *Rubia peregrina Linn.*, *Inula viscosa Desf.*, *Zollikoferia casinianæ Jaub.*, *Thymelæa hirsuta Linn.*, *Salsola rigida Pall.*, *S. inermis Forsk.*, *Noœa spinosissima Moq.*, *Polygonum equisetiforme J. & S.*, *Allium sinaiticum Boiss. Asplenium ceterach Linn.*, *Andropogon hirtus Linn.*, in addition to those already mentioned as reaching here a southern limit, and the Abou Kosheibeh lants, which also, as a rule, occur on Mount Hor.

The majority of these additions occurred from about 3,000 feet to the summit. I extract a few notes from my journal on this subject.

At 3,000 feet Oleander and tamarisk cease, Scilla abundant; at 3,450 feet Thymelæa (Passerina) first occurs; at 3,750 feet numerous species occur, as Pterocephalus, Globularia, Onosma, Juniperus, Ceterach, Cheilanthes, Fagonia, Cotyledon, Capparis spinosa, Varthamia montana, Phlomis, Ononis, Deverra, Moricandia dumosa, Rhamnus as I ascend; at or near the summit (4,400 feet about) are Geranium, Colutea, Pistacia, Pennisetum cenchroides, Hyoscyamus aureus, Noœa, Poterium spinosum, Scilla, Malva, Carex, Ephedra, Zollikoferia, Echinops, Verbascum sinuatum, Origanum Ajuga tridactylites, Arum sp., Bryonia, Sternbergia, and Colchicum, of species already mentioned.

Of Wâdy Musa, in which Petra is situated, Irby and Mangles write: "Following this defile farther down, the river reappears, flowing with considerable rapidity. Though the water is plentiful, it is with difficulty that its course can be followed from the luxuriance of the shrubs that surround it obstructing every track. Besides the oleander, which is common to all the watercourses in the country, one may

recognise among the plants which choke this valley, some which are probably the descendants of those that adorned the gardens and supplied the market of the capital of Arabia: the carob, fig, mulberry, vine and pomegranate line the river side; *a very beautiful species of aloe* also grows in this valley, *bearing a flower of an orange hue shaded to scarlet;* in some instances it had upwards of one hundred blossoms in a bunch." Several of these were not observed by us. Of the aloe I can give no information.

At Petra, 2,900 feet above sea-level by my aneroid, many of these and others occurred; the most prominent were Phlomis, Ononis, Thymelæa, Rubia, Rhamnus, Pistacia, Inula, Sternbergia, Bellevallia, Rumex roseus, Verbascum sinaiticum, Ficus sycamorus, and a stunted pinnate-leaved shrub or small tree, perhaps a Fraxinus. The Ononis, very viscid, with pretty yellow and claret coloured veined flowers, was very abundant. So also was Thymelæa. Sternbergia (Colchicum) macrantha was glorious with flowers of golden yellow, as large as a lemon.

Few observations on animal life were obtained in this hurried visit, but these were all of interest.

Ibexes and gazelles were seen on Mount Hor, and a hare of the Egyptian variety fled from Wâdy Haroun at our approach. Another, seen at Petra, much lighter in colour, may have been the Nubian form.

When climbing Jebel Abou Kosheibeh, a clear loud flute-like whistle attracted my attention. The first few times I heard it I was fully persuaded it was a signal to warn those rascally Petra Bedouins that hated Christians were invading their domain. But I presently saw the whistle belonged to a bird, which proved to be Tristram's Grakle. This species, originally discovered by Tristram about the Dead Sea, has since been found in Sinai at Wâdy Feiran by Wyatt, who also met it at Petra. All the time we were on this mountain several of these birds kept flying around us, often displaying the orange spot on the wing as they hovered close by. Their flight is very graceful, sometimes hovering butterfly-like, sometimes swift and undulating in large curves like the chough. Grakles were seen afterwards a little above Petra, and a flock of a dozen or thereabouts circled round the summit of Mount Hor, disappearing and reappearing from the corners of the red sandstone cliffs, and giving notice of their presence with their melodious whistle. This is probably a favourite breeding place with these birds. It was not until I reached the Dead Sea that I obtained a specimen.

At Petra also occurred the Palestine bulbul, and the rich musical cry of the fantail raven, *Corvus affinis Rupp.*, was almost incessant while we were there. Nevertheless this bird hardly came nearer than two or three hundred yards, and would be difficult to obtain. By its note and by its size, and by its broad expanded tail seen on the wing, I was assured of the species on referring to Canon Tristram's work. This raven and the grakle are two of that author's characteristic birds of the Dead Sea basin.

Hey's sand-partridge, shrikes, and desert larks are also not unfrequent, the latter lower down towards the Arabah.

To Laurence's sharp sight I was indebted for two snakes, *Zamenis*

cliffordii Schleg. and *Rhyncocalamus melanocephalus Gunt.* The latter species was believed peculiar to the Jordan Valley, where it was found by Tristram, and forms as yet the single representative of the genus founded for it by Dr. Gunther. The former has not hitherto been found outside the African continent.

A centipede (Scolopendra) and a black millipede (Spirostreptus) four or five inches long, but fortunately torpid, were captured here. The latter seemed to be very common.

Wells, which I often searched with a net, yield, as a rule, no life except small leeches and the larvæ of gnats. Some handsome insects of the grasshopper and cricket sorts were captured from time to time.

Up to this very few mollusca have been collected. *Helix seetzeni Koch* and *H. candidissima Drap.* were found in one or two places in Sinai. The latter was again met with in Wâdy Ghurundel in Edom, where I found also *H. prophetarum Bourg.*, *H. filia Mouss.*, and the handsome species *H. spiriplana Oliv.* On Mount Hor this last was frequent, and another fine shell, *Bulimus carneus Pfr.*, was here first found. Most of these became commoner down to the Ghôr. At Petra, and in the Arabah, I collected also *Helix cæspitum Drap.*, a rare species. This scarcity of land shells is paralleled on the eastern side of the Gulf of Akaba in the land of Midian, where Captain Burton speaks of them as very rare, and mentions that he only met with two species in four months. In its natural history this little known country appears to be (judging from Captain Burton's work) almost identical with Sinai.

CHAPTER VIII.

Wâdy Haroun to the Dead Sea.

The mouth of Wâdy Haroun into the Arabah is somewhat more than halfway from Akaba to the Dead Sea. The watershed between the Dead Sea and the Gulf of Akaba is nearer to Akaba. We estimated its lowest point at 660 feet above sea-level. It lies on the west side of the Arabah. At the mouth of Wâdy Haroun the Arabah is at its widest, being about thirteen miles across. The total distance from Akaba to the Dead Sea is 112 miles.

My chief detour in this part of the Arabah was on the east side, up a long valley to the Edomitic plateau with Mr. Armstrong. On this occasion we returned to the Arabah by a more northern valley, Wâdy Ghuweir, which, from the numerous remains of encampments, tribe marks ("Wasum"), and the well-worn tracks, appeared to be a leading thoroughfare into the Shobek country.

In this wâdy are several springs, appearing, as is frequently the case, at the union of the sandstone and limestone formations. One of these springs supported a jungle of reeds with palms and some interesting

composite species of luxuriant growth. Tamarisks, acacias, and nubk trees (Zizyphus) were in some profusion, and on each of these three trees the handsome parasite, *Loranthus acaciæ Zucc.*, with its handsome red flowers, was a conspicuous ornament. It was seen only two or three times on the tamarisk, oftener on the nubk, but much more usually on the acacia. Clinging to the reeds was an Asclepiad, *Cynanchum acutum Linn.*, whose range is more Mediterranean than the others met with. Amongst them was the stately *Saccharum ægyptiacum W.* and a shrubby composite, *Pluchea dioscoridis D.C.*, reached a height of 15 feet. Its flowers were insignificant. A red-barked osier, *Salix acmophylla Boiss.*, and a poplar, *Populus euphratica Linn.*, which is perhaps the willow of Babylon, occurred along the margin of the short-lived stream. Other species collected were—*Erucaria aleppica Linn.*, *Tribulus terrestris Linn.*, *Ficus carica Linn.*, *Salsola tetragona Del.*, and others less noteworthy. A very fragrant savory, *Satureia cuneifolia Ten.*, and our early acquaintance the "sekkaran," *Hyoscyamus muticus Linn.*, occurred.

At the head of this valley *Juniperus phœnicea* was found to be the tree visible from the Arabah on the white chalky plateau of Edom, and growing abundantly. Burton found this tree luxuriant and abundant at considerable heights in Midian three degrees farther south.

In this wâdy I gathered maiden-hair fern, the first I had seen since leaving Jebel Musa. Caper (*Capparis spinosa*), *Lycium arabicum*, and *Boerhavia verticillata* also occurred. Bushes of nubk were sometimes canopied with this latter trailing plant, with its pretty panicles of blueish small flowers.

The Bedouins told me that with the juniper trees on Edom occur also "balût," *Quercus coccifera Linn.*, and "arour," a thorn with a small sweet fruit. This was, I believe, *Rhus oxyacanthoides Linn.*, which the above-mentioned traveller found abundantly in Midian. I met it subsequently in the Ghôr.

In Wâdy Ghuweir I captured the first Batrachian I met with, *Bufo viridis Linn.*; running water, the rarest and pleasantest of sights in these regions, was the source of this increased variety of life.

At the Arabah, abreast of the above valley, I examined some large bushes of *Calligonum comosum L. Her.*, a desolate, leafless, whitened; scrubby species which often grows in shifting sand. Its roots are beautifully adapted to secure its position. These are woody, springy, and tough, very different from the brittle branches, and about a quarter of an inch in diameter. Some of these are seven or eight yards in length, perhaps much more, and beset with knobs at intervals, which are serviceable in giving them a better grip. These excrescences may have been due to insects, for I afterwards noticed that this plant was much subject to galls; but whatever their origin, they served the purpose of the flukes of an anchor to hold the bush in a sea of shifting sand.

There appears to be a great variety of gall-producing insects in the desert. Almost every woody species is liable to knobs and swellings. One of the most curious of these appendages was that frequently attached

to the common Salsola—a shapely little spurred and coloured excrescence like a solidified flower of one of our commoner wild orchids.

A minute cruciferous annual, half an inch high, leafless and with a silicle which formed almost the entire plant, was so fragile that it failed to reach home. The silicle valves had separated, dehiscing from the base upwards, one at either side of the septum.

In this part of the Arabah *Pancratium Sickembergeri* was frequently gathered. At the spring of Ain Abou Weirideh, a little south of Wâdy Ghuweir, I obtained many old friends. Populus euphratica attains here good dimensions. No less than three running streams maintain a brief but productive existence across the sands. I gathered here *Prosopis stephaniana Willd.*, *Pulicaria arabica D.C.*, *Statice pruinosa Linn.*, *Artemisia monosperma, Del.*, *Suæda asphaltica Bois.*, *Salsola fetida Forsk.*, and many more.

Several bulbous species were obtained here. One of these which has flowered since my return has been determined by Mr. Baker, *Urginea undulata Desf.*

Further north, towards the Ghôr, I collected *Eremobium lineare Del.*, *Monsonia nivea Dcne.*, *Anastatica hierochuntina Linn.* ("Rose of Jericho"), *Astragalus Forskahlii Boiss.*, *A. acinaciferus Boiss.*, *Rhamnus sp. ?*, *Carthamus glaucus M.B.*, *Androcymbium palæstinum Baker*, *Allium Sinaiticum Boiss.*, *Aristida ciliata Desf.*, *A. plumosa Linn.*, *Panicum trugidum Forsk.*, with the usual desert species.

The most noticeable feature in the animal life in the northern half of the Arabah has been already mentioned. I allude to the extraordinary abundance of small holes and burrows in stone and gravelly sand. The riddled surface reminded me forcibly of the lemming haunts of Discovery Bay, in lat. 81° 45″ north, where, however, all were due to one species with the exception of those of a larger rodent, the stoat, who preyed upon the lemmings. One would expect to find a carnivorous rodent subsisting on the abundant supplies here also, but none such has been as yet discovered. The holes in Wâdy Arabah vary from small ant-holes and lizard cachès to those of rabbit-holes, and one or two fox-holes (?) were also observed. Tracks of various sizes also abound. Jerboas, porcupine mice, gerbilles, and sand-rats (Psammomys) are the groups represented, of which it is very difficult to secure specimens during a hurried march like ours. Canon Tristram, however, enumerates a considerable variety. One which I trapped here, *Gerbillus erythrurus Gr.*, was sand-coloured and the size of a large rat, and is now in the British Museum. It does not appear in Canon Tristram's work. This gerbille is a wide-spread desert form, from Candahar to Algiers. The holes of this species, and some others, are surrounded outside, besides being well supplied inside, with little heaps of chopped fragments of plants, leaves, seeds, and other remnants of vegetation. Ant-roads are also conspicuous, about an inch wide, and firmly and smoothly pressed down.

Porcupine quills and decomposed remains of hedge-hogs were several times picked up in the north end of the Arabah.

At Ain Abou Weirideh sub-fossil shells were obtained in marl deposits at about 1,400 feet above the level of the Dead Sea, or about 100 feet above sea-level. Two of these, *Melania tuberculata Mull.*, *Melanopsis Saulcyi Bourg.*, have been figured by Professor Hull at page 100 in his work already referred to. I gathered besides these *Melanpsis bucoinoidea Oliv.*, and *M. eremita Trist.* These are fluviatile or lacustrine species, and are all found still living round the Dead Sea in various streams and springs. The last-mentioned species is very rare, and I did not find it alive, but Canon Tristram discovered it at the south-western Ghôr. These marls, in the opinion of geologists, are remaining deposits of an ancient lake or inland sea, of which the Dead Sea is all that now exists. From where we now stood to near the source of the Jordan, about 225 miles northwards, must have been a continuous sheet of water in (geologically speaking) tolerably recent times.

Lower marls are very characteristic at an average level of 600 feet above the present level of the Dead Sea. I searched these marls for similar remains in many places, but always found them absolutely barren in records of the past, and very rarely inhabited by any existing life, vegetable or animal. Trunks of palms, floated to, and then embedded in these marls at the base of Jebel Usdum, form no exception; since these may have been drifted thither in times which are as yesterday compared with the "middle marls." The upper marls are fairly vegetated with the existing flora. The natural conclusion would be that the ancient sea, at first harbouring fresh-water inhabitants, became reduced by a long process of evaporation, or some other cause, to about a mean height between its present and its earliest level, and that it was already so salt that it was almost if not quite uninhabitable.

At this height, judging from the extent of the middle marls, the waters must have remained stationary for a very considerable period, while most of the upper marls became converted into the lower formation by a long process of denudation. From the latter elevation to the present the subsidence has no doubt been very recent, and is still continuing. The most recent deposits of the Dead Sea are of course perfectly barren, except of mixed drift, or where these have been converted into marshes or fertilised by the few small fresh-water streams.

But I anticipate in my anxiety to get down to the fertile Ghôr es Safieh.

At Ain Abou Weirideh a small flock of pintail grouse circled round the wells, but I failed to obtain a specimen. Subsequently I recognised the note and obtained the bird, *Pterocles senegalensis Linn.*, at Bir es Seba. Its call is very peculiar, recalling the strange utterance of the Manx Shearwater.

On the night of the 14th we were visited with a thunderstorm and a tremendous downpour of rain. Rain had also fallen on the 3rd December, the day we left Akaba; this was our total from Cairo to the Dead Sea. The thunder on the 14th was grand and continuous for about three-quarters of an hour. Lightning flashed at about every five seconds.

CHAPTER IX.

South end of the Dead Sea.

On the 16th of December we obtained our first view of the Dead Sea and descended to the plain at its southern extremity. The whole depression in which the Dead Sea lies, 1,300 feet below sea-level at its surface, is called the "Ghôr," or "Hollow." On the first night we camped in the Ghôr el Feifeh, and from the 17th to the 26th inclusive we were detained at the Ghôr es Safieh while waiting for means of transport from Jerusalem.

This enforced delay in so unique a locality was to me a most fortunate circumstance. Previous visitors do not appear to have obtained more than a hurried peep at the Ghôr es Safieh. The difficulties arise from the hostile character of the adjoining tribes of Arabs, who are constantly engaged in predatory warfare, the Ghôr es Safieh being very frequently the scene of their conflicts. Our imaginations were kept excited by continual reports and warnings of those terrible Kerak Sheikhs, Huwaytats, and others who were about to demolish us. I had also read and heard much of the impossibility of doing any good exploring work where an escort is always necessary, and where the Bedouins were bent on plundering unwary strangers. However, day after day I followed the bent of my inclinations frequently alone, climbing the eastern hills, searching the jungles and marshes, and collecting birds and plants without ever receiving the smallest annoyance.

The Ghôr es Safieh, where we spent ten days, lies at the south-eastern end of the Dead Sea, about 1,250 feet below the level of the Mediterranean. It is watered by the Garahi river as the Feifeh is by the Tufileh, both descending from the eastern highlands. Between these two oases there is a strip of desert. Both these streams were well supplied with water during our visit, and I understood from the Arabs that the Garahi at least was unfailing. The latter is called also El Ahsi, Hessi, and Safi, and the Nahr el Hussein. Smith's Ancient Atlas calls it the Brook Zered. It is distributed into numerous smaller watercourses for purposes of irrigation by the cultivating Ghawarnîheh Arabs, by whose tented village we were encamped. There is another smaller village, called, I believe, El Feifeh, of which we obtained a passing view.

The whole distance from the base of the sudden descent from the barren white marls into the plain is about ten miles to the Dead Sea. The Ghôr es Safieh is about three to four miles wide. The upper Ghôr of El Feifeh is, as I have said, cut off from the lower by a strip of desert, an unwatered patch of sand-dunes and Salsolaceæ. On the east the Ghôr is bounded by the highlands of Moab, and on the west by the briny, muddy, barren bed of the Tufileh. Steep marl banks, a couple of hundred feet high, enclose it on the south, while northwards it gradually becomes salter and swampier, with a diminishing vegetation to the lifeless margin of the Dead Sea.

On the Moab cliffs, as also on the Judæan to the west, the lower

declivities are flanked in many places with saline white marls to an upper limit of 650 feet. These marls are absolutely barren *in situ*, but they are fast being washed down by aqueous denudation, and thus purified they are scattered by irrigation over the Ghôr. A minute beetle, of the genus *Galbella*, was a slight exception to this barrenness, which is of course interrupted in the beds and by the margins of the occasional watercourses. This new species, whose description will subsequently be given, is most nearly allied to *G. beccari Gest* of Abyssinia.

The upper Ghôr is by no means so fertile as that watered by the larger and more northern stream. The latter issues with a south-westerly direction from a narrow cleft, or "sîk," in the red sandstone by which I penetrated for a few miles into that desolate country. The river is here confined to the base of the sharply cut cleft, and confers no fertility on the unaltered marls above. This cleft is 50 to 150 feet in depth or more, and the period required for its formation must place the marls above at a high antiquity. It should be borne in mind, however, that the water supply is probably now at its minimum, and the means of erosion were formerly much greater. The bed of this stream was in places absolutely dangerous from a curious cause. The side being vertical there was no upward escape, and the bed of the stream was so deeply clogged with the soft moving mass of silted fine mud that, although there was not more than 18 inches of water, I was compelled, and with difficulty, to retrace my course. As usual when anything risky is attempted, my native deserted me. At its embouchure from the cleft this remarkable stream passes though the lower gravel and shingle deposits which form the basement of the marls.

On this occasion, when crossing the marls above, I came suddenly upon three ibexes. They whistled or snorted like Highland sheep. I let fly ball cartridge from my fowling piece, but missed them. My shots attracted some wild and villainous-looking mountaineers, who followed me to camp that night, where I first became aware of their existence. They could not make themselves understood, but I fancy wished to know should they hunt the "beden." Almost immediately after I lost sight of the ibexes I came across some very interesting and rather extensive ruins of apparently great antiquity. I brought the whole of our party to the spot the following day. The ruins will be found planned and described in Professor Hull's work at page 121, and again in Major Kitchener's Appendix to the same at page 216. I leave it to future explorers to identify this site with the ancient Gomorrah.

The following observations were obtained from Sheikh Seyd, of the Ghawarniheh, with regard to the Ghôr :—

"Rain generally falls on about ten or twelve days of the year, usually during December and January. Some years there is none. Much more is seen on the highlands on either side, which does not reach the Ghôr.

"They grow wheat, barley, oats, dhourra (Sorghum), indigo (one sort), tobacco, and Indian corn.

"Wheat, barley, and dhourra are sown in January ; Indian corn in March. Tobacco is sown in January. Indigo is sown in March. They grow

some white grapes on trellises. They do not know henna (Lawsonia) Zukkum (Balanites) is common, but made no use of. Mallow is boiled and eaten. Osher (Calotropis) is given to women when barren, or to procure milk, the milk of the bush being taken. Water-melons and cucumbers are cultivated. Of the fruit of the Salvadora (arak) they make a sort of treacle or sweet mixture. Never heard it called 'Khardal;' Khardal is mustard, but they have none.

"They (the Ghawarniheh) mostly leave the Ghôr and go up to the hill country in the hottest weather. Snakes and insects are very bad and very numerous in the Ghôr at that season."

My inquiries about Salvadora were made relative to its claims to being the tree of the mustard-seed parable. I could get no corroboration from these Bedouins of this view, first put forward by Irby and Mangles, who are not, however, responsible for the statement that it is called "Khardal" (mustard), nor do they say, as has been misquoted, that they found the "Ghorneys" using it as mustard. The theory has not, in fact, "a leg to stand on."

Mr. Merrill, U.S. Consul at Jerusalem, has kindly made inquiries for me as to the origin of the seed sown by the Arabs. He informs me they save it from year to year, but if they should run short they obtain supplies from Jerusalem. It is to the Mediterranean sea-board westwards, therefore, we must look for the home of any suspicious weeds of cultivation in the Ghôr; and those which are not natives of this region may perhaps be held less open to question as to their being indigenous in the Ghôr.

No sooner has the river Hessi issued from its unfruitful ravine than the scene changes as if by magic. As it moistens the plain, an extensive growth of bushy, low-sized trees almost covers the district.

In the upper Ghôr these are densely tangled and matted, almost to the exclusion of other growth, and afford shelter for multitudes of birds. In the lower Ghôr the trees are more scattered; often no doubt in the more peopled district being consumed for firing, and thinned to admit of pasturage and cultivation. These trees are chiefly Acacias (three sorts), Salvadora, Zizyphus, and Balanites. There is also a Rhamnus not unfrequent, and Mr. Lowne mentions Moringa aptera. This latter writer misquotes the authors (Irby and Mangles), whom he criticizes, when he ascribes to them the remark that the oasis contained "an almost infinite variety of shrubs and bushes." Their words are: "the variety of bushes and wild plants became very great," a phrase which is well within the bounds of the reality.[1]

Of these trees the Salvadora is the most abundant, and usually occupies a slightly lower region than the Acacias. It grows in clumps, several stems arising together, branching at once, and all combining to form a single tree. It is very leafy above, with small entire leathery leaves; below it displays a labyrinth of greyish branches. The flowers and fruit

[1] I quote from Murray's edition in the Colonial and Home Library, vol iv, p. 108, ed. 1884.

are small and numerous. It attains a height of about 20 feet, a stray branch reaching to 25 or 30 feet. The Balanites (Zukkum) is usually a smaller tree, and is now in full fruit. Its fruit is green and wrinkled, somewhat like that of a walnut. Its leaves are few and small. The Zizyphus is the well-known sidr or thorn of the Arabs, the dôm when reaching a large size. Its branches, strewed in lines along the ground, form the fences to protect the grain from cattle.

As the plain slowly lowers to the Dead Sea, becoming at the same time gradually moister, the vegetation changes. The above species decrease in the number of individuals. Tamarisks, Osher, Salsolas, Prosopis, and Atriplices take their place in abundance. Of these, the Osher (Calotropis procera) is the most remarkable. It is somewhat like a gigantic small-leaved cabbage bush, with a strong infusion of cactus blood and the bark of a cork-tree—utterly strange-looking to European eyes. Its fruit, the size of a large apple, is full of silk and air, and is probably to be identified with the "apples of the Dead Sea." The drawing of these "trees that beren fulle faire apples, and faire of colour to beholde," by Sir John Maundeville, is by no means unlike the Osher. If the early traveller's figure stands for any real thing it is probably for this bush, which here attains a remarkable size. Of it the writers already quoted say: "We were here (Ghôr es Safieh) surprised to see for the first time the Osher plant, grown to the stature of a tree, its trunk measuring in many instances 2 feet or more in circumference, and the boughs at least 15 feet in length, a size which far exceeded any we saw in Nubia; the fruit also was larger and in greater quantity." This remark is interesting in connection with Captain Burton's, that the Osher in South Midian is "a tree, not a shrub" ("Land of Midian," ii, 206), as though the plant was more at home in the Eastern continent. Castor-oil (Ricinus communis) is also very conspicuous and large (20 to 25 feet), chiefly in the same localities as the Osher. Other bushes are the leafless Leptadenia pyrotechnica, and the poplar, Populus euphratica. All these were seen in the Ghôr el Feifeh also. A tree of the latter, about 50 feet high, near the Dead Sea, is, I think, the largest tree in the whole Ghôr. Oleanders and Osiers are confined to the embouchures of the stream from the mountains or farther up.

As we approach the Dead Sea, occasional swamps produce jungles of various late grasses, chiefly Arundo Phragmites (*P. gigantea J. Gay*), *Erianthus Ravennæ P. de B.*, and *Imperata cylindrica P. de B.*, mixed with several Cyperaceæ, of which the most interesting were *C. eleusinoides Kunth.*, and sparingly, I believe, *C. Papyrus Linn.* Salter patches are given up to Juncus maritimus and *Eragrostis cynosuroides Retz.* The former (var. arabica) was from 4 to 7 feet high. Tamarisks, Suædas, Salsolas, Salicornia, and Atriplices are the last to fail. Tamarisk, Salicornia herbacea, and a Ruppia not in flower, probably *R. spiralis, L'Her.*, were the very last; the former all along the inner margin, the latter two where the mud of the sea is in union with that of the Tufileh estuary. The latter two encroach downwards upon the forbidden area here, from

salt swamps to those which are too salt, as they do upwards in our own country, from salt swamps up fresher estuaries until they meet those which are too fresh.

A brief space, fifty yards or more, varying with the slope and the fulness of the basin, is barren saline mud or sand. This foreshore is at other seasons under water, and all which is liable to be submerged is barren, except in the two instances above mentioned on the Tufileh mud.

An interesting assemblage of sea plants is congregated around the Dead Sea. These are *Sonchus maritimus Linn.*, *Inula crithmoides Linn.*, *Lotus tenuifolius*, *Rchb.* (*Lythrum hyssopifolium Linn.*), *Salicornia herbacea Linn.*, *Salsolæ*, *Suædæ*, *Atriplices*, *Scirpus maritimus Linn.*, *Fimbristylis dichotoma*, *Rottb.*, *Juncus maritimus Linn.*, and *Ruppia sp.?* (*R. spiralis L'Her.?*). Some of these at first sight will hardly fail to impress the observer with the idea that the vegetation must recently have undergone distinct maritime conditions; but a little reflection will show that the visits of aquatic birds, and the present suitability of the circumstances, suffice to explain their presence. Moreover, the most conspicuous are of the easily diffused pappus-bearing compositæ.

Several of the most interesting species were obtained by penetrating into the jungles in all directions. In the very heart of these, Cynanchum acutum was abundant, trailing convolvulus-like about the reeds. These jungles, and along the banks of the stream, were my best hunting grounds.

The luxuriance of some familiar British aquatic plants may be alluded to. The sea rush, as already mentioned, reaches 7 feet in height, Inula crithmoides 4 to 7 feet, and Lycopus europæus, 5 to 6 feet in height, while gigantic plants of Lythrum salicaria had reached a height of 14 feet!

One of my most interesting "finds" was that of a handsome acacia, *A. læta Br.*, in the Ghôr. This species has not been recorded north of Syene (Assouan) in Upper Egypt, seven degrées farther south. There were several trees of this very distinct species, which is much larger and better furnished than the other acacias met with. An Arab to whom I silently pointed out one of this species at once exclaimed "Sont," and proceeded to show me the difference in its leaves and fruit from that of a Seyal, its neighbour. At Akaba an Arab called a large A. tortilis "Sunt." It is an Egyptian name, but never applied to the "Seyal."

A few other remarkable species not noticed by previous botanists in Palestine may be mentioned:—*Cocculus Læba D.C.*, *Sclerocephalus arabicus Boiss.*, *Zygophyllum simplex Linn.*, *Indigofera pancifolia Del.*, *Rhynchosia minima D.C.*, *Trianthema pentandra Linn.*, *Eclipta alba Linn.*, *Pentatropis spiralis R. Br. Salsolaceæ* (several), *Digera arvensis Forsk.*, *Boerhavia verticillata Poir.*, *B. repens Linn.*, *Euphorbia ægyptiaca Boiss.*, *Cyperus eleusinoides Kunth.*, and some others. Several of these are distinctly tropical, and add to that most interesting group of those plants already known to inhabit the "sultry Ghôr."

I gathered altogether at the southern end of the Dead Sea about 225 identifiable species of flowering plants. The total there may reach 300.

Many annuals and Mediterranean spring plants, especially of the Leguminous and Cruciferous orders, were still in a young condition.

I defer a fuller analysis for the present, merely remarking that the flora of the Ghôr, a unique locality, is even more interesting, and that in no mean degree, than it has hitherto been shown to be.

The Ghôr has been visited by two competent botanists, Messrs. B. T. Lowne in 1864, and W. Amherst Hayne in 1872, both in Canon Tristram's company. These gentlemen have, however, hardly dealt with the oasis of Es Safieh. Mr. Hayne's essay, appended to Canon Tristram's "Land of Moab," is only enough to make a botanist wish for more of it, while Mr. Lowne's valuable paper, published by the Linnean Society, deals with the south-western extremity of the Ghôr, two dry desert wâdies whose flora is the northern wave from Sinai and the Arabah.

Although devoid of life, the sandy beach of the Dead Sea mentioned above was full of interest. On it were strewed salted remnants of a variety of insects, beetles, spiders, locusts, and seeds which had been floated from the Ghôr by the rivers and promptly killed and cast ashore. Several of these were identifiable, although of no value as specimens. A better collection in the same place was that of shells. In some places these were thickly strewn, and I went through these natural museums with the greatest care, obtaining thus several varieties not previously found in Palestine. Amongst these are *Planorbis albus Mull.*, *Limnæa peregra Desf.*, *Physa contorta Mich.*, *Achatina* (*Cionella*) *brondeli Bourg.*, *Ferrusacia thamnophila Bourg.*, and a new species of Bulimus.

The tamarisks near this were inhabited by a species of ant. These make their home, in parties of 20 or 30, in a sort of purse of vegetable matter, made out of scraps triturated together and worked into a smooth papery lining. The species is *Polyrhachis seminiger Mayr.*, belonging to a tropical, chiefly Indian, genus. Multitudes of little fishes, *Cyprinodon dispar Rupp.*, as mentioned by Tristram, were seen in the salt pools close by.

Although my visit was too early for many species of plants, yet on my first day in the Feifeh I found at once numerous kinds not seen in Sinai, of which a good many were both in flower and fruit. These must flower continuously, or with a very brief respite; others, chiefly European and Mediterranean species, were rapidly advancing to the flowering stage during our sojourn in the Ghôr.

A good number of Sinai species occur in the Ghôr. An effect of the moister climate on some of the woolly desert plants was noticeable. These became very perceptibly less so in the Ghôr. Pulicaria undulata, P. arabica, Tribulus terrestris, Verbascum sinuatum, may be instanced. Possibly the salinity of the atmosphere assists in this; the tendency of plants to become glabrous by the seaside is familiar. On the other hand, excessive dryness appears to provoke pubescence in plants, as well as other striking qualities of pungent odours, gummy exudations, and conversion of leaves to spines, all of which we may expect to find diminished if the species can accommodate itself to moister conditions.

I have hitherto spoken almost entirely of the plants. The district is of as great interest in other branches of natural history. Canon Tristram's various works have made this fact familiar. My prolonged stay at an unusual season must indeed be my excuse for trespassing on a subject he has made so peculiarly his own.

The Ghôr swarmed with birds. About forty species were observed, of which, with two or three exceptions, specimens were obtained. Some, especially doves of two species, and bulbuls of the sort already met, were extraordinarily abundant. The doves were the Indian collared turtle, *Turtur risorius Linn.*, and a smaller beautifully bronzed species, *T. senegalensis Linn.*

On the Dead Sea mud, redshanks, lapwings, and sandpipers flitted and fed, but they were confined to those parts of the margin which were tempered by fresh water. Snipe, water-rails, and ducks of British sorts were frequently met with. Marsh sparrows in great flocks also kept near the shore. Buntings and larks of three sorts were in vast numbers throughout the stubbles of maize. The two desert partridges occurred on the margins of the Ghôr, where also the thicknee was shot. Shrikes, "boomey" owls, marsh harriers, buzzards, sparrowhawks, and kestrels were all noted. The mellow, loud whistle of Tristram's grakle frequently caught the ear, as did also the excessively discordant craking note of the Smyrna kingfisher. The beautiful little sunbird and the gaudy blue-throated robin were about equally common, the former usually frequenting those acacias which gave support to the handsome Loranthus. Several other warblers were observed, but for most of these, as well as the swifts and others, the season was too early. On the upper ground at the edge of the Ghôr several pairs of desert chats of two or three kinds might be always studied, and the impression the Ghôr gave me was that many migratory species of Palestine who ought to travel south from the Jerusalem plateau in winter found here a conveniently close and sufficiently warm retreat which they utilise in vast numbers.

Burrowing animals still give evidence of their abundance. Traps set for these were, I believe, appropriated by Bedouin lads, for I could never rediscover them. The traps were strong, and I trust they snapped on their meddlesome fingers. Jackals kept up their high-pitched scream throughout the night. Bedouins, bantams, jackals, and jackasses have all peculiarly high notes in the Ghôr. They howl together in a shrill minor key chiefly when they ought to be asleep.

Fresh boar tracks were always visible; on one or two occasions I heard the animals crushing in the jungle close ahead of me. Ibexes were seen in the ravines close by.

There are many cattle scattered through the Ghôr. These are chiefly small pretty black animals with white faces, somewhat like the Highland breed, while goat-like sheep and sheep-like goats with ears hanging 6 inches below their snouts, are herded evening and morning. Donkeys are more numerous than ponies; there are very few of the latter in the possession of the much molested and peaceful Ghawarnibeh.

The Bedouins supplied us with poor milk and very small eggs.

Insect life had as yet hardly awakened. About half-a-dozen species of butterflies were observed, of which some were Ethiopian forms. Scorpions were still torpid. Molluscs, except fluviatile, were scarce, while Batrachians and Reptilia might have been almost non-existent with the exception of the Lacertidæ.

A very nimble fresh-water or rather marsh crab was very abundant. To this animal was due the multitude of burrows amongst the tufts of Juncus maritimus near the Dead Sea. Twice I saw them disappear with incredible swiftness into these holes, which were of various sizes, and of so great a depth or length I could not usually dig them out. Several that I did dig out were blind or empty, and at first these holes puzzled me beyond measure. The total absence of tracks or pads leading to them arrested my attention, while their widely different sizes, both in length and diameter, suggested something altogether new. Those crabs I obtained were by means of the Bedouin lads. The carapace of the biggest was about 5 inches by 3. They are grey in the young state, but attain a reddish tint when full grown. The species is *Telphusa* (*Potamophilon*) *fluviatilis Savign.* One was killed in our camp, showing that they ramble at night away from water or marshy places. This crab extends through Egypt to Algiers, and occurs also, I believe, farther east than Palestine.

At the time of our visit the mean diurnal temperature was about 50° Fahr. There is no universal check to vegetation in the Ghôr. Acacias, Osher, castor-oil, Loranthus, Salvadora, species of Abutilon, Zizyphus, and Balanites were bearing fruit and flower now in the coldest season in true tropical fashion.

Before we left, the sun was just beginning to "braird the lea," and there was a delicate hue of green perceptible across the ill-tilled soil.

The river, Seil Garahi, alias Hessi, was well filled with water, and on several occasions we enjoyed a swim down the swift deep rushes at the inner edge of the plain. Irby and Mangles, I think, found this river dry on their return journey from Petra.

Before bidding farewell to the Ghôr I should mention one striking peculiarity in its flora. I allude to the great number of species compared with the number of individuals. If those few gregarious kinds (chiefly trees, grasses, and shrubs) already mentioned be eliminated, the remaining sorts would very often depend on a few plants for their claim to a place in the list. Hence a brief visit may give rise to many omissions.

CHAPTER X.

Ghôr es Safieh to Gaza.

On the 27th December we finally struck tents and left our camp in the Ghôr es Safieh. As we passed westward near the south end of the

Dead Sea some interesting features were observed. The waters vary in their surface level about 3 feet between the brief wet period and the minimum level. During our visit they stood at a low level, and the drift of timber and terrestrial shells showed an upper margin at a uniform height in several places. Where the shore slopes very gradually, as in most places round the southern end, this variation in depth is sufficient to leave a wide space of foreshore uncovered. This was very noticeable during our journey along the base of Jebel Usdum, at the south-west corner of the Dead Sea. The water was there about 600 yards from the line of drift. Inside this was the usually traversed track along the base of Jebel Usdum, and above, about 7 vertical feet higher than the present high-water drift, was an older well-marked margin looking very recent and pointing to a still continuing evaporation of its waters in excess of the supply.

Logs of palm-trees frequently marked these margins, and these were seen embedded in a drifted position in the marls of Jebel Usdum as much as 27 feet above the highest level now attained by the waters of the sea. Palm-tree trunks were also seen along the river Tufileh in the Ghôr el Feifeh and lower about its estuary. These were probably, from their appearance, torn out of its bed during a flood in a semi-fossilised condition. Thus the subsidence of this sea has continued and is continuing, and earlier deposits are being continually carried down to form more recent ones and to fill up the cavity. Most parts of the Dead Sea south of the Lisan are very shallow. In two places, when looking for a swim, abreast of Jebel Usdum and north from the Ghôr es Safieh, I waded out several hundred yards without getting water above my knees, and the water, like that at the mouth of the Jordan at the other end, is usually turbid. The work of reclamation steadily proceeds, and as the sea is known to be of very considerable depth (200 fathoms) in other places there is abundant room for the inflowing sediment.

Of Jebel Usdum I have given a description to Professor Hull which has appeared in his account of our expedition. It proved, as it looked, to be of little botanical interest, and I should not have climbed it had I not seen it stated in several places that it was inaccessible. The plants found on its upper portion, 650 feet above the Dead Sea, were very few, the whole being a bare flat with a slight central ridge of barren marl—the cap of the central core of rock-salt. A couple of solitary tamarisks occurred and several Salsolaceæ. The latter were *Noœa spinosissima Moq.*, *Atriplex alexandrina Boiss.*, *Salsola rigida Pall.*, var. *tenuifolia.*, *S. letragona Del.*, *S. fœtida Del.*, and *S. inermis Forsk.* The "mountain of salt" is, in fact, well characterised by this order. Several of the above are additions to the flora of Palestine. On the western slope a few desert species of the ordinary and familiar types were collected, and these gradually increased to the base at the Mahauwat Wâdy, whose flora has been already the subject of a special paper by Mr. Lowne. This writer gathered here, and in the neighbouring Wâdy of Zuweirah, eighty-two flowering species chiefly of the desert sorts. These are all, or almost all, either Sinaitic or occur in the Wâdy Arabah.

Leptadenia pyrotechnica Forsk., and *Ochradenus baccatus Del.*, grow to a large size here. The latter was about 15 feet high, close to the Dead Sea, at the confluence of these two wâdies. *Zilla myagroides Forsk.* was here in flower, bearing a pretty little blossom like our Cakile maritima.

During the ascent of Wâdy Zuweirah to the plain of South Judæa the following fresh species were collected :—*Notoceras canariense R. Br.*, *Enarthrocarpus lyratus D.C.*, *Zollikoferia sp.?* (*Z. stenocephala Boiss.?*), *Lithospermum tenniflorum Linn.*, *Heliotropium rotundifolium Sieb.*, *Ballota undulata Fres.*, *Arnebia linearifolia D.C.*, and *Plantago Loefflingii Linn.* A large bulb, *Urginea Scilla Stein.?*, now only in leaf, marks well the transition stage from the Ghôr flora to that of the Judæan wilderness. Desert species, as Fagonia, Zygophylla, Retama, Acaciæ, Resedaceæ, Cucumis, Microrhynchus, Dæmia, Ærua, Forskahlea, and others were here for the most part taken leave of. These ascended perhaps a third part of the climb, several ceasing at about the old Saracenic Fort. Upwards, and on the Judæan plain, a great change takes place. We found ourselves ere long on rich land arousing itself to a spring growth, although the most inclement season was not yet reached. The need of water is of course everywhere apparent. Withered remains are scarcer than in the desert, and the ground is often bare for considerable spaces, or with a few early patches of species to be presently mentioned. It becomes difficult to recall the existence of the contiguous Ghôr flora with its perennial luxuriance. Hardly a bush and no trees are observed to break the monotony. Travelling still westwards, evidences of cultivation, that is to say of the soil being "scratched" and sown, appear. Soon after Bir es Seba, two days from the Ghôr, we find ourselves amongst softly swelling downs covered with sowers and ploughers, but otherwise monotonous in aspect, as the cretaceous limestone formation usually is.

The species first observed at the head of Wâdy Zuweirah and upwards to Bir es Seba were numerous, many of them spring Mediterranean species just opening their flowers. The following were conspicuous :—*Carrichtera Vellæ D.C.*, *Biscutella Columnæ Ten.*, *Enarthrocarpus lyratus*, *Del.?*, *Silene dichotoma Ehr.*, *S. Hussoni Boiss.*, *Helianthemum Kahiricum Del.*, *Astragalus sanctus Boiss.*, *A. alexandrinus Boiss.*, *Erodium cicutarium Linn.*, *Senecio coronopifolius Del.*, *Scorzonera lanata M.B.*, *Calendula arvensis Linn.*, *Achillea santolina Linn.*, *Anchusa Milleri Willd.*, *Cyclamen latifolium Sibth.*, *Ajuga Iva Schreb.*, *Satureia cuneifolia Ten.*, *Marrubium alysson Linn.*, *Salvia verbenaca Linn.*, *S. controversa Ten.*, *S. ægyptiaca Linn.*, *Eremostachys laciniata Linn.* (in leaf only), *Paronychia argentea Lam.*, and *Urginea undulata Steinh.* (?). Several of these are pretty little bright-flowered yellow and blue annuals.

We were now travelling on horseback, and I had no longer the same facilities for botanising. The pace was usually too fast. My method was to keep well ahead till I reached some inviting point, and then dismount and botanise, usually holding a rein across my arm. The result was that I was usually left far behind, or in hot pursuit of the party. Sometimes I lost my way altogether. It would have needed a botanical circus

rider to get on and off his horse with comfort as fast as new flowers occurred.

Several mosses and lichens were gathered on this march. The mosses were *Tortula muralis Linn.*, *Bryum atropurpureum W.* and *M.*, and a Hepatica, *Riccia lamellosa Raddi.* The mosses are both British species.

In animal life, gazelles, mole-rats, *Spalax typhlus Pall.*, and sand-rats, *Psammomys obesus Rupp.*, appeared to be the most abundant. I captured examples of the latter two, which are now in the British Museum.

The mole-rat, the Asiatic representative of the English mole, though of a very different family, is a strangely ugly little animal with long protuberant teeth. Mr. Armstrong showed me a ready way of obtaining specimens, which at first sight appeared to be hopeless. His plan was to watch the freshly up-lifted heaps of soil which are raised in line at short intervals, and notice the direction the animal is burrowing in by the relative freshness of the heaps. Soon a slight movement will be observed in the freshest heap or beyond it, and on firing a charge into the ground at once, the gun about a foot from a point a few inches ahead of the moving place, the animal will be stunned and may be at once dug out, probably alive. I tried this plan twice successfully.

A buff-coloured snake, about 3 feet long, *Zamenis atrovirens Gray*, was killed in the neighbourhood of Tel Abou Hereireh. Geckos and toads were also captured. A brown and grey fox (Vulpes nilotica?) was seen near Bir es Seba. Laurence shot a fine wild cat (*Felis maniculata Rupp.*) in a gulley near Tel Abou Hereireh. It measured 2 feet 8 inches from the tip of the nose to the tip of the tail, the tail itself being 1 foot. It was of a greyish-brown colour, brindled with sandy brown across the back and down the sides. The tip of the tail was ringed with black. This is supposed to be the cat found embalmed in Egyptian monuments. It is found along the Nile, and as far south as Abyssinia.

I spent as much time as I could in digging up bulbs. Of these there were several identifiable species, as *Xiphion palæstinum Baker*, a dwarf sweet iris, with large flowers in tints of buff and French grey. *Colchicum montanum Linn.* occurred in the greatest abundance, white or pale mauve, and was very beautiful. *Urginea Scilla Sternh.* and *Asphodelus ramosus Linn.* were most abundant, increasing westwards to Gaza. *Bellevallia flexuosa Boiss.* and *Ornithogalum umbellatum Linn.* also frequently appeared.

About Bir es Seba the birds observed were cranes, black and white storks, buzzards and kites, trumpeter bullfinches, pintail grouse, Greek partridge, black-headed gulls and lapwings, as well as several desert larks and chats. The technical names of these species will subsequently be enumerated. The trumpeting of the crane was heard frequently, usually at night.

At Tel el Milh, in a swamp, a flock of teal was flushed, and a number of the black or Sardinian starlings came to roost in the rushes. Their note is different from that of our species. A snipe handsomely marked

with white, as seen in flight, with a rich brown back, and showing vivid green tints also on the upper surface, was unfortunately missed. It uttered a peculiar quacking cry, and I had several good views of it, There were three or four birds in the marsh, and I have no doubt it was the painted snipe, *Rhynchæa capensis Linn.*, which has not previously been known to inhabit Palestine. It is a widely spread species in Africa.

The Cyclamen and the Colchicum are constantly exciting our admiration. In the marsh just mentioned *Spergularia marginata Koch.*, *Cyperus longus Linn.*, and *C. lævigatus Linn.*, var. *junciformis*, were collected.

A feature noticed by all travellers is the abundance of snails on the small shrubs, chiefly on Anabasis articulata Boiss. The commonest of these was perhaps *Helix Seetzeni Koch.*, but I also gathered *H. joppensis Rottb.*, *H. syriaca Ehr.*, *H. protea Zugl.*, *H. vestalis Pass.*, *H. tuberculosa Conrad.*, *H. candidissima Drap.*, *H. Boissieri Charp.*, and *H. cavata Mouss.* H. cavata and H. Boissieri are the finest of these species in size, the latter being a heavy solid-shelled sort. H. tuberculosa is trochiform, or top-shaped. This species and his flattened brother, *H. ledereri Pfr.*, gathered between Gaza and Jaffa, are both scarce. They are the prettiest, being delicately mitred and foliated at the whorls.

The black-headed gulls, and no doubt others of the birds, subsist on these molluscs.

Continual evidence of wild boars occurred, and some of our party had the good luck to obtain a sight of a "sounder," or family party. They seem to feed chiefly on the bulbs, of which some large kinds are marvellously plentiful. An Urginea (probably *U. undulata*) was sought after especially, so that it was with difficulty roots which they had not mashed were obtained to bring home. It has since flowered, and in the absence of leaves is doubtfully referred to this species by Mr. Baker. Urginea Scilla covers the ground for miles, and grows sometimes to the exclusion of everything else. It appears to be a scourge to the fellahin. Great heaps of its bulbs, the size of a melon, are often met with, and lines of its growth are commonly left to mark off each cultivator's allotted space. *Asphodelus ramosus Linn.* is nearly as common. The brilliant anemone (*A. coronaria Linn.*), the "lily of the field," was picked in flower on the last day of the year. The curious stringy *Thymelæa hirsuta*, whose acquaintance I first made on the shores of Brindisi on the outward journey, is profusely common. Between Bir es Seba and Gaza the species now in growth are almost altogether of the Mediterranean type. A few desert species occur, but chiefly of a Syrian or Mesopotamian character, as Caylusea canescens, Deverra tortuosa, Alhagi maurorum, Peganum harmala, Citrullus colocynthis, Artemisia herba-alba, and Anabasis articulata.

The universal "rimth" (Anabasis or Salsola) of the Sinai Bedouin is called by the Doheriyeh Arabs "Shegar." It may be that the Arabs put off inquiries from one whom they perceive to be unlearned in their language with trivial and unmeaning terms; but the results of my short experience would tend to show that little importance can be attached to

these local names. Different tribes and places yielded different terms, so that on comparing my collection of Arab plant-names with those given by several other writers, hardly two were identical, or even alike. In the Serbal district of Sinai, Wâdy Rimthi takes its name from the Anabasis.

The soft note of the trumpeter bullfinch, rising and falling as if borne on the wind, while the bird is concealed on the ground somewhere close by, often arrested my attention. It was impossible to tell whether it was ten yards or ten times that distance away.

Travelling west past Tel Abou Hereireh to Gaza, the following plants occurred in addition to those mentioned already about Bir es Seba :— *Malcolmia pulchella Boiss*, *Matthiola humilis D.C.*, *Alyssum Libyca Viv.*, *Erucaria microcarpa Boiss.*, *Capsella Byrsa-pastoris Linn.*, *Polycarpon succulentum Del.*, *Dianthus multipunctatus Ser.*, *Silene rigidula Sibth.*, *Ononis serrata Forsk.*, *Hypericum tetrapterum Fres.*, *forma.*, *Erodium hirtum F.*, *Bupleurum linearifolium D.C. ?*, *Carthamus glaucus M.B.*, *Thrincia tuberosa D.C.*, *Tolpis altissima Pers.*, *Scorzonera alexandrina Boiss.*, *Mandragora officinarum Linn.*, *Withania somnifera Linn.*, *Echium plantagineum Linn.*, *Lamium amplexicaule Linn.*, *Euphorbia exigua Linn.*, *Paronychia nivea D.C.*, *Andropogon hirtus Linn.*, and *Poa annua Linn.*

CHAPTER XI.

Gaza to Jaffa.

At Gaza we were kept a few days in quarantine by the Turkish authorities. This was not because we were deemed infectious (the idea was absurd), but to levy a tax on our purses. By the prompt interference of Lord Dufferin, British Ambassador at Constantinople, to whom we telegraphed, we were released in four days instead of being confined for a fortnight.

This delay was to me most valuable, as it enabled me to sort my rapidly made collections of the last few days.

On our last day, having liberty to leave quarantine ground, I gathered a good many species south of Gaza which I had not seen before. Many of these belong to well-known Mediterranean types, but there is still an important admixture of desert and Egyptian forms, belonging to a somewhat more southern group.

Gardens of fruit trees, olive groves, and enclosures hedged by the prickly pear (*Opuntra vulgaris Linn.*) reached our camp from the inland side. On the leeward we were hemmed in by high sandhills, the vanguard of an ever advancing column, driven westward by the prevailing winds, which is gradually swallowing up Gaza, old and new, as well as a long belt of coast north and south of it.

Some laborious journeys across this belt of sand, often three or four miles broad, impress them vividly on my memory. They yielded exceedingly few species, being as a rule completely barren. I may

mention *Silene succulenta Forsk.*, *Scrophularia xanthoglossa Boiss.*, *Euphorbia terracina Linn.*, which grew well out on the dunes.

These sands are effecting a steady and enormous change along the coast. It is difficult to reach what is left of Ascalon, which remains on an insulated patch of rocky ground by the sea completely cut off inland. Little of it is left unsmothered. Ashdod is undergoing the same fate. Gaza retreats inland in front of the arenaceous sea, and it is only at intervals, or by ascending some eminence which is rarely met with, that one obtains even a view of the Mediterranean. This was to me a keen disappointment, and I sighed for the reality for a cliff-girt coast like that of north-western Donegal.

In and about the Gaza olive groves several birds familiar at home abounded. Others occurred on the plain hard by. It was refreshing to hear their well-known voices in this strange and inhospitable land. There were English sparrows, swallows, buntings, goldfinches, black redstarts, chaffinches, stonechats, willow-wrens, and chiffchaffs, blackbirds, and hooded crows. Other birds seen were Egyptian kites, buzzards (common species), "boomey" or little southern owl, red-breasted Cairo swallows, pelicans, dunlins, calandra and crested larks, bulbuls, pied chats, and Menetries' wheatear.

At an estuary about four miles south of Gaza, and up a flat wâdy leading to it, I obtained several good plants. This would be capital ground to botanise at a later season. The following are the most interesting :—*Brassica Tournefortii Gou.*, *Cratægus azarolus Linn.*, *Neurada procumbens Linn.*, *Ceratonia siliqua Linn.*, *Astragalus aleppicus Boiss.*, *A. macrocarpus D.C.* (not in fruit), *Medicago laciniata All.*, *Ononis natrix Linn.*, var. *stenophylla*, *Anagyris fœtida Linn.*, *Acacia albida Del.*, *Prosopis stephaniana Willd.*, *Xanthium strumarium Linn.*, *Artemisia monosperma Del.*, *Centaurea araneosa Boiss.*, *C. pallescens Del.*, *Atractylis prolifera Boiss.*, *Linaria Hælava Forsk.*, *Anchusa ægyptiaca Lehm.*, *Prasium majus Linn.*, *Andrachne aspera Linn.*, *Ficus sycomorus Linn.*, *Ricinus communis Linn.*, *Boerhavia verticillata Poir.*, *Plantago albicans Linn.*, *Euphorbia peploides Gou.*, *Emex spinosus Camp.*, *Salsola inermis Forsk.*, *Cyperus schœnoides Griseb.*, *C. rotundus Linn.*, *Fimbristylis dichotoma Rott.*, and *Pennisetum cenchroides Rich.* Some of these, as the castor-oil, the little anomalous desert Neurada, and the tropical Boerhavia, point to the great heat of Gaza.

The trees about Gaza are chiefly date-palms, olives, sycamore fig, caroub (Ceratonia) or locust-tree, and fig ; a very handsome tamarisk (*T. articulata Vahl.*) reaches a height of 30 or 40 feet, and has bright green foliage very refreshing and home-like after the dull grey or lifeless green of the desert. The olives are of enormous age. They usually have unbranched trunks, 2 or 3 feet in height, then perhaps divided, and at 7 or 8 feet the leafy canopy, browzed below to a level height by cattle, begins. The average height of the tree is 20 to 25 or 30 feet. Old trees have often mere shells of their trunks remaining. I measured the two largest I saw, a few miles north of Gaza ; their right

was 18 and 20 feet respectively at 2 feet from the ground, a size which was maintained, or very nearly so, till the trunk forked.

At Ascalon, which Laurence and I visited at a gallop just before dark, I gathered *Calycotome villosa Linn.* in the sands, a pretty yellow shrubby pea-flower. Ascalon is a wilderness of shifting sands. The small space of remaining earth is inhabited by a few Arabs, from whom I got my first Jewish coins. Several pillars of marble and black granite lie about the ruins of the crusading fort, but none are in position.

Frequently dogs with unmistakable traces of jackal parentage were seen along here. I was assured it is by no means uncommon for these animals to interbreed along this part of the Mediterranean seaboard.

The chief crop showing is of lentils. I saw bean-stalks a foot and a half high in the first week of January.

A few of the commonest British plants, as Capsella Bursapastoris, Silene inflata, Convolvulus arvensis, and Rumex obtusifolius, occur along here.

A handsome tree introduced from the East is very common. It is the Melia azederach, or Pride of India. It is deciduous, and only bearing fruit, as I saw it, along the enclosures or by the villages. *Lycium europæum Linn.*, *Rubia olivieri A. Rich.*, *Ephedra alata Dcne.*, *Asparagus aphyllus Linn.*, and *A. acutifolius Linn.*, are the larger plants, which help to stop up the gaps in the prickly pear fences.

At Yebdna, and thence to Jaffa, *Narcissus Tazettæ Linn.* was in flower. Some damp low-lying patches were white with it. Other species were *Ruta graveolens Linn.*, Erodium sp.? (*E. bryoniæfolium?*), *Retama retam Forsk.* (in flower), *Lithospermum callosum Linn.*, *Echiochilon fruticosum Desf.*, *Thymus capitatus Linn.*, *Lavandula stœchas Linn.* and *Rhamnus punctata Boiss.* The Retem broom was in flower, very pretty, white variegated with purple. I found it once previously in blow in the desert.[1] *Lawsonia alba Linn.* (henna) was seen several times, but usually here (as at Akaba) either in or on the verge of enclosures. No doubt it remains from ancient gardens at Engedi, where it is, I believe, abundant. It is native much farther east.

In the gardens next the hotel at Jaffa were some very interesting plants. I did not learn their history, or who made the collection. Some of the Sinaitic and Dead Sea plants were there—the handsome trailing pea, *Dolichos lablab*, which I found in the Ghôr, a widely cultivated plant in hot countries, but perhaps originally introduced from India. The Sinaitic Gomphocarpos, a milky asclepiad with pods full of silk, one of the most remarkable species in the peninsula, was here also; it differed, however, from the Sinaitic plant in being shrubby and about

[1] This is the Hebrew "rothem" or "rotem," translated juniper in the Old Testament. The same name (Retama) is applied to a species of a closely allied genus, the *Spartocytisus nubigenus*, of the middle zone of vegetation of the Peak of Teneriffe, as I learn from Mr. Moseley's "Notes by a Naturalist 'Challenger,'" p. 5.

6 feet high, while the desert plant averaged from a foot to a foot and a half.

Ricinus communis (the castor-oil); Echaverias, Lavandula Stæchas (the handsome purple woolly lavender just mentioned), and quite a collection of Acacias and Mimosas, with oranges, bananas, indiarubber trees, fan-palms, Eucalyptus, Mesembryanthemums, and many others made up a tropical garden which will well repay the traveller's visit. I was peculiarly interested to see my Boucerosia from Mount Hor here, a cactus-like plant, which seems to be a new species. Can it be, like the Dolichos, an ancient weed of cultivation? When we let the mind go back to times of ancient civilisation, to the traffic and merchandise of pilgrims, monks, and Bedouins, of Israelites and Phœnicians, Pharaohs and Ptolemys, Greeks and Romans, Turks and Crusaders, caravans and ships laden with food, with gums, spices, fruits, and wares during the whole history of mankind, we must reflect that many plants we now view as inhabitants, especially those of any economic use, may have hailed originally from remote sources. Speculations of this kind, at once so uncertain and so unpalatable, had better perhaps not be indulged in. They can only lead to doubt and discussion. Granted that the "osher" is known by the Bedouin "Doctrine of Signatures" as a plant of domestic value, may we not theorise as to whether wandering tribes have not carried it from Midian or Nubia to Sinai? from Sinai to its far northern home in the Ghôr? and so with many others. This line of thought, which these gardens naturally produced, may, I think, except in rare instances, be better dispensed with.

The gardens at Jaffa were fully supplied with its own brand of most excellent oranges.

CHAPTER XII.

Jerusalem.

Between Ramleh (a few miles from Jaffa) and Jerusalem, during an ascent of over 2,000 feet, many fresh species occurred. The chief change in plant life lay in the great increase of low shrubby vegetation on the limestone hills and terraces. I had little time to botanise, but with hard galloping to make up for delays, I secured several sorts in condition to be studied. An oak, *Quercus coccifera Linn.*, and a handsome large-leafed arbutus in full flower, *Arbutus andrachne Linn.*, are two conspicuous trees or bushes characteristic of the rocky regions above the plain of Ramleh. A large daisy, *Bellis sylvestris Cyr.*, similar except in size to our own Bellis perennis, was in flower. The handsome locust-tree, usually here of only the stature of a bush from being cut for firing like the others, is very frequent. Its rich dark green pinnate foliage is well known to travellers in Southern Europe, where its pods are much used to feed cattle. This is supposed to be the "locust" of St. John. At Kirjath-

jearim a solitary date-palm occurs, and I was informed at Jerusalem that near this a clump of native pines, *Pinus halepensis Linn.*, exists. Maiden-hair, ceterach, and the sweet Cheilanthes, were the ferns gathered, chiefly amongst the limestone clefts above Bab el Wad. A handsome sage, *Salvia triloba L.*, was in flower, and several other labiates, as *Phlomis sp.?*, *Micromeria barbata B. & K.*, *M. myrtifolia Boiss.*, *M. nervosa Desf.*, and *Teucrium polium Linn.* were collected. A bryony, *B. syriaca Boiss.*, and a beautiful clematis with dull purple flowers, *C. cirrhosa Linn.*, trailed along the roadside walls near the villages. The leafless Ephedra and Asparagus still help to increase the variety. The spiny-branched *Calycotome villosa Linn.*, and *Anagyris fœtida Linn.*, yellow pea-flowered shrubs, are not uncommon. Other less important plants are—*Reseda alba Linn.*, *Malcolmia crenulata Boiss.*, *Thlaspi perfoliatus Linn.*, *Erodium moschatum W.*, *Thelygonum cynocrambe Linn.*, *Ononis natrix Linn.*, *Inula viscosa Boiss.*, *Sherardia arvensis Linn.*, *Alkanna Tinctoria Tausch.*, and *Onosma syriaca Lab.* Most of these are common about Jerusalem and Bethlehem.

The birds noted were almost entirely British species. Of these the wheatear had not been seen before. *Saxicola lugens Licht.*, and I think *S. finschii Heugl.*, were eastern chats not seen since leaving the Ghôr, but here not unfrequent.

While at Jerusalem we came in for an unusually heavy fall of snow, lasting from 20th to 25th of January. There was therefore little to be done in botany around the Holy City. Fortunately we had accomplished our pilgrimage to Jericho before the snow set in, which gave me an opportunity of comparing the northern with the southern Ghôr, or hollow of the Dead Sea.

About Jerusalem, but especially along the tiny aqueduct between the Pools of Solomon and Bethlehem, some plants were in flower. *Erodium malacoides Linn.*, *E. gruinum Linn.*, *Pistacia palæstina Boiss.*, *Sedum sp.* (*S. altissimum Poir.?*), *Tordylium brachycarpa Boiss.*, *Torilis trichosperma Spr.*, *T. leptophylla Rich.*, *Pimpinella cretica Poir.*, *Galium judaicum Boiss.*, *Pisum fulvum S. & L.*, *Lathyrus blepharicarpus Boiss.*, *Carduus argentatus Linn.*, *Urospermum picroides Desf.*, *Crepis senecioides Del.*, *Anchusa mulleri Willd.*, *Onosma syriaca Lab.*, *Hyoscyamus aureus Linn.*, *Cyclamen latifolium Sibth.*, *Plantago lagopus Linn.*, *Viscum cruciatum Linn.*, *Euphorbia aulacosperma Boiss.*, *Gagea reticulata R. & C.*, *Agrostis verticillata Willd.*, and *Avena sterilis Linn.;* as well as some common British plants, as *Nasturtium officinale R. Br.*, *Cerastium glomeratum Thuill.*, *Geranium molle Linn.*, *Torilis nodosa Gœrt.*, *Rubus discolor W. & N.*, *Veronica anagallis Linn.*, & *V. Beccabunga Linn.*, will serve to give botanists an idea of the species occurring at this season.

Jerusalem, 2,400 feet above sea-level, falls within Boissier's "Plateaux" subdivision of the Oriental region. His "Flora Orientalis" deals with the countries from Greece to India in a width of about twenty degrees of latitude north of the tropics; and he divides these into (1) Mediterranean, (2) Middle Europe, (3) Oriental, and (4) Region du Dattier [or Desert].

The Oriental is subdivided to Plateaux, Aralo-Caspian, and Mesopotamian. In the first of these subdivisions of the Oriental region, Jerusalem and Damascus and the districts around and above each of these cities are placed.

The climate of Jerusalem is milder and more Mediterranean than most parts of this sub-region. The date-palm, though not native nor able to ripen its fruit, can exist, and grows to goodly dimensions, as evidenced by one well-known tree. Others occur a little lower towards Ramleh. Here and at Damascus, as I subsequently saw, the prickly pear is naturalised. A "pipi" tree, *Cæsalpinia Gilliesii*, a highland species from Buenos Ayres, was amongst the few cultivated species noticed in a recognisable condition. It was in flower beneath the windows of the Mediterranean Hotel.

From an intelligent resident at Jerusalem I obtained some information of the vegetable products of its neighbourhood which may, I think, be deemed reliable, and gives an idea of the climate.

"Frost, though occurring annually for some nights usually at the end of January, rarely lasts throughout the day, and hardly penetrates the soil [where there is any].

"The sycamore fig, orange, mandarin orange, and lemon, which ripen their fruit so well at Jaffa, will not do so at Jerusalem.

"Apricots, tomatos, grapes, figs (?), thrive better at Jerusalem than Jaffa. Pomegranates and nectarines do fairly well at Jerusalem.

"Bread melons [Artocarpus integrifolia ?] and water melons, which attain a weight of 20 to 30 pounds at Jaffa, will not ripen at Jerusalem.

"A small plum, like a greengage, succeeds better at the elevated station; but strawberries, apples, and pears have all been unsuccessfully tried.

"Olives bear well about Jerusalem, especially after a winter of snow and cold; each tree generally gives a good crop every second year. Hail sometimes damages the fruit much.

"Sesame (Sesamum indicum) is grown on the plains; its oil is used for cooking purposes [and I suppose for adulterating the olive oil]. The pulp is given to animals. It is a summer crop like the dhourra [Sorghum] after wheat and barley."

Cupressus sempervirens Linn., var. *pyramidalis*, the funereal cypress, attains a great size in the esplanade between the mosques of Omar and El Ahksa, but far finer trees were seen later at Smyrna. The "Prince of Wales tree," *Pinus halepensis Mill.*, pointed out by this name as the tree the Prince camped under, is the finest tree near Jerusalem. It is about 50 feet high, and well furnished. Smaller ones occur at the Armenian convent.

An interesting plant of Jerusalem is the red-berried mistletoe, *Viscum cruciatum Linn.*, parasitic on olive-trees, and known elsewhere only in southern Spain. Mr. Armstrong, who was always willing (when his duties permitted) to give me a helping hand, brought me specimens from the Valley of Jehoshaphat.

During the snow at Jerusalem a gazelle was shot within a mile or two of the city. This was, I believe, a very unusual occurrence. I saw the animal immediately after its death.

CHAPTER XIII.

Jericho and Northern Ghôr.

On the 14th of January we went down to the Jordan Valley. Immediately after leaving Mount Olivet I found abundance of *Androcymbium palæstinum Baker* (Erythrostictus Boiss.), first seen in the Arabah above the Ghôr. It is a stemless white-flowered plant, small but leafy, and with rather large flowers of no particular beauty. It belongs to the Colchicaceæ. I mention it specially because Mons. Barbey mentions that Roth found this plant close to Jerusalem, but that after careful search he (Barbey) was unable to rediscover it. I am thus able to confirm Roth's record. Mons. Barbey's visit (April 3) was perhaps too late for the species.

On descending even a slight distance to the east the climate at once improves. Bethlehem and the neighbourhood of Solomon's Pools are distinctly milder than Jerusalem. We gradually travel from mid-winter into spring. Several plants met with before as we climbed out of the Ghôr by Wâdy Zuweirah, are again in flower as we descend. Fumaria, Carrichtera, Biscutella, Malcolmia, Erucaria, may be quoted. Fresh forms occur, as *Hypecoum procumbens Linn.*, *Capsella procumbens Linn.*, *Neslia paniculata Linn.*, *Hippocrepis unisiliquosa Linn.*, *Hymenocarpus circinnatus Linn.*, *Astragalus callichrous Boiss.*, *A. sanctus Boiss*, var., *Trigonella arabica Del.*, *Matricaria aurea Boiss.*, *Chrysanthemum coronarium Linn.*, *Veronica syriaca R. & S.*, *Arnebia cornuta F. & N.*, *Asperugo procumbens Linn.*, *Emex spinosus Camp.*, *Muscari racemosum Mull.*, *Lamarckia aurea Mœnch.*, and others. These are mostly small bright-coloured spring flowers. At about sea-level some desert species begin to occur, as *Zygophyllum album Linn.* (in flower), *Prosopis Stephaniana Willd.*, *Reseda pruinosa Del.*, *Rætama rætam Forsk.*, *Ochradenus baccatus Del.*, *Tamarix gallica Linn.* var., and a few more of the southern Ghôr plants.

We are again amongst the marls, and before long those of the 600 feet level, so conspicuous round the Dead Sea, can, as Professor Hull concludes, be traced, but evidently far more completely denudated in this moister and more fluviatile district. Lower marl-terraces occur, but various searches failed to bring any more sub-fossil shells to light. Canon Tristram has gathered at 250 feet in the marls near here shells identical with those obtained by us at Ain Buwerrideh.

The flora of this part of the Jordan Valley is to a certain extent a repetition of that of the southern Ghôr, but many of the interesting species are missing, and others of more familiar types take their place. Widespread European species are much more numerous. Common

British species of Draba, Capsella, Thlaspi, Nasturtium, Rubus, Heloscia-dium, Malva, Galium, Veronica, Mentha, Solanum, Lythrum, Cichorium, Verbena, Euphorbia being all met with, in about the total of five species in the northern Ghôr to one in the southern. Nor did the season at Jericho appear to be more advanced than that at Es Safieh.

Jericho and its neighbourhood have been amply described by many able writers, and its botany has been well illustrated by Mons. Barbey in his work already referred to. This latter visitor has not, however, corrected one statement repeatedly made by various travellers, that of the ancient palm grove, extending for several miles around Jericho, there is no existing representative. There is one date-palm, 20 feet high, at Gilgal.

Of the characteristic species of the southern Ghôr growing here, I may mention *Zizyphus spina-christi Linn.*, *Balanites ægyptiaca Del.*, *Loranthus acaciæ Zucc.*, *Calotropis procera Willd.*, and *Populus euphratica Oliv.*, the latter being abundant along the Jordan. This poplar is remarkable for the extraordinary variety of shapes in its leaves, especially in young trees and saplings. In full-grown trees, like the one described at the Ghôr es Safieh, they become more uniform; ovate and slightly incised sometimes at the base, or faintly lobed in a wavy fashion. No trees were seen near Jericho in a mature condition. Tamarisk and the "zukkum," or false balm of Gilead (Balanites), are very abundant here. An acacia near Ain es Sultan was, I believe, *A. albida Del.*, gathered previously at Gaza. It was a stunted bush, and our old friends the acacias of Sinai and Es Safieh have all disappeared except the Prosopis Stephania, a small ragged little shrub. This little ill-favoured acacia, which thrives best on saline wet places, bears a very peculiar pod, swollen, solid, and irregular, and so like a gall or deformity of some kind that it was not until opening it and obtaining its seeds I could believe it to be a natural growth.

Bananas, oranges, and a few sugar-canes are cultivated in the Arab gardens at Gilgal, the modern Jericho.

The ornithology of the Jericho district runs in parallel lines with the botany. The European sorts are much commoner than in the Ghôr es Safieh, and the tropical and Asiatic forms generally less so. Only one couple of sunbirds, and but a few of the "hopping-thrushes" (Argya squamiceps) were seen. Shrikes were few. The palm-dove and the collared turtle were not scarce, but they were not as one to twenty here compared with those of the more southern oasis. A few bulbuls (*Pycnonotus xanthopygus H. & Ehr.*), pied chats, *Saxicola lugens Licht.*, and desert blackstarts, *Cercomela melanura Temm.*, occurred.

On the other hand, English robins, jays, chaffinches and wheatears were seen here, though not at the Ghôr es Safieh. Blackbirds, wagtails, and stonechats were commoner, and an unexpected northern visitant, a redwing, *Turdus iliacus Linn.*, was shot at Ain es Sultan. This bird has not previously been obtained in Palestine, but it is likely that the wave of unusually severe weather, about to be felt by us at Jerusalem, drove many of its companions into the country.

The river Jordan was considerably swollen, and so muddy that a plunge in its waters did not look inviting. However, Laurence and I swam it and set foot on the other side of Jordan. It was about thirty yards across, with a strong current, about enough to give equal drift and headway to a swimmer. The water was too turbid for me to learn much about its inhabitants ; however I picked up two molluscs, a bivalve and a univalve (*Corbicula Saulcyi Bourg.* and *Melanopsis costata Oliv.*) on the muddy edge of the stream.

We returned to Jerusalem by Marsaba, where we camped on the night of the 16th—unhappily our last experience of "tenting," the most enjoyable kind of Eastern life. Our intended expedition by Tiberias and Merom through northern Palestine ending in Beyrout was put a stop to by heavy snow. Before dismissing Jericho I have to mention the species gathered which were not previously met with :—*Ranunculus asiaticus Linn.*, *Matthiola oxyceras D.C.*, *Saponaria vaccaria Linn.*, *Silene palæstina Boiss.*, *Arenaria picta Sibth.*, *Rhus oxyacanthoides Dum.*, *Ammi majus Linn.*, *Aizoon hispanicum Linn.*, *Ononis antiquorum Linn.*, *Evax contracta Boiss.*, *Amberboa Lippii D.C.*, *Hedypnois cretica Boiss.*, *Hagioseris sp.?* (*H. galilæa Boiss.? Picris sp.?*, *Orobanche ægyptiaca Pers.*, *Linaria albifrons Sibth.*, *L. micrantha Cav.*, *Cuscuta sp.?* (*C. palæstina Boiss.?*), *Convolvulus siculus Linn.*, *Vitex agnus-castus Linn.*, *Phalaris minor Retz.*, *Schismus marginatus P. de B.*, *Bromus madritensis Linn.*, *Kœleria phleoides Pers.* Of these the Orobanche was a lovely bright blue species, and the Rhus a pretty red-berried thorn very like the hawthorn, but with flattened berries and minute flowers. This thorn has been found as far south as latitude 26° in Midian at about 4,000 feet above sea-level by Captain Burton. The Ononis was an erect shrub, about 5 or 6 feet high, with a few slender long spiny branches and some scattered flowers like those of our own restharrow. The Ranunculus is so like Anemone coronaria (which occurred) that it was not at first distinguished from it. Both are of a gorgeous scarlet. The Vitex was one of the very few northern representatives of the tropical Verbenaceæ. It is a straggling shrub, with dull blue flowers of no beauty, and, like many other Jericho plants, found all round the Mediterranean.

Young fragments, chiefly of Cruciferæ, Leguminosæ, and Umbelliferæ, were often picked, but for these orders the season was too little advanced.

Grasses and bulbous plants were also often too young.

On the way to Marsaba, a rough ride across many deep ravines, an interesting effect of aspect was noticeable. A slight greenish hue showed plainly on the hillsides with a northern aspect, while the others were as yet completely barren. In those places where the heavy dews of night are less rapidly dried up by the noonday sun, vegetation is no doubt always more abundant, the effect of shade also being to assist the early growth. An analogous effect was still more sharply defined in a different way on steep slopes looking southwards. These presented the usual monotonous barren chalky white appearance on riding upwards, where the eye only caught the outstanding bosses and prominences of rock and soil in the wâdy bed. It was difficult to recall this on looking back from

above in a commanding position. The numerous little depressions and shaded hollows with the first symptoms of incipient vegetation gave a faint green tint to the whole. The one rested the sight, the other was a painful glare. It was about the difference between tinted and plain glass spectacles.

At Marsaba there is a date-palm tied up and supported in the court-yard of the convent, which the monks relate was planted by St. Saba (A.D. 490). Without vouching for the truth of this statement, I was interested to learn that it always bears a stoneless fruit. Of the truth of the latter information I believe there is no doubt. This convent is interesting to ornithologists as the place of the discovery of Tristram's Grakle, whose acquaintance I had first made at Mount Hor. There were several about the convent during our visit.

On the 17th we reached Jerusalem. A week later we left for Beyrout, where our party divided itself, Professor Hull and his son returning homewards. Laurence and I, however, faced the snow and succeeded in crossing Lebanon and Hermon by the admirable French road to Damascus, visiting Baalbeck on the way. As I am not writing a volume of travels I will bring this part of my subject to a close. The snow lay many feet deep on these mountains reaching to Damascus and Baalbeck, so that I was unable to make any collections or observations of consequence on the natural history of this country, which is, moreover, fairly well made known by the researches of several eminent naturalists.

YOMA, OR THE DAY OF ATONEMENT,

With the Commentary of Rabbi Obadiah of Bartenora.

CHAPTER IV.

1. He shook[1] the box[2] violently and took out the lots.[3] Upon one was written "for the Name." And on the other was written "for Azazel." The sagan was on his right and the chief of the house of the fathers on

[1] He seized, snatched, the box and took the lots suddenly with violence.

[2] (As we learn above "and a box was there." And why was it opened with violence and haste?) In order that he might not endeavour to find out by delay which was the lot for the Name, and to take it out in his right hand, for it was a happy sign when it came up in his right hand.

[3] One in his right hand, and one in his left. And the goats were standing one on his right hand and one on his left, and he put the lot which came up in his right hand upon the goat on his right hand, and the lot which came up in his left hand upon the goat on his left hand.

his left. If *the lot* for the Name came up in his right hand, the sagan said to him, "my lord high priest, lift up thy right hand," and if the lot for the Name came up in his left hand, the chief of the house of the fathers said to him, "my lord high priest, lift up thy left hand." He put them upon the two goats, and said, "a sin-offering to the Lord."[4] R. Ishmael said "it was not necessary to say 'a sin-offering'[5] but only 'to the Lord.' And they repeated after him,[6] 'blessed be the glorious name of His kingdom for ever and ever.'"

2. He tied a crimson band[7] upon the head of the goat which was to be sent away, and caused it to stand opposite the place whence it was to be sent away,[8] and *the goat* which was to be slain[9] opposite the place of its slaying. He *now* came to his bullock the second time, and laid his two hands upon it and confessed. And thus he said, "O God, I have done iniquity, I have transgressed, I have sinned[10] before Thee, I and my house, and the sons of Aaron, the people of Thy holiness. O God, forgive the iniquities and the transgressions, and the sins which I have done, and transgressed, and sinned before Thee, I and my house and the sons of Aaron the people of Thy holiness, as is written in the Law of Moses Thy servant (Levit. xvi, 30), for on that day shall the *priest* make an atonement for you, to cleanse you *that* ye may be clean from all your sins before the Lord," and they said after him, "blessed be the glorious name of His kingdom for ever and ever."

3. He slew *the goat*, received the blood in the sprinkling-basin, and

[4] The *Shem Hamphoresh* (which was the name spelt with *yod he*) was pronounced as it is written.

[5] The decision was not according to Rabbi Ishmael.

[6] When he pronounced THE NAME.

[7] Wool dyed red.

[8] Opposite the gate by which they caused it to go out.

[9] The band of crimson was tied opposite the place of its slaying, that is to say its neck; so that it might not be changed for the goat which was to be sent away, for this had the band tied to its head and that to its neck; and neither of them were likely to be changed for another goat, for these had a crimson band tied to them, and other goats had not a crimson band tied to them.

[10] The Mishna is that of Rabbi Meyer which he learns from the Scripture, as it is written (Levit. xvi, 21), "and confess over him all the iniquities of the children of Israel, and all their transgressions in all their sins." But the wise men disputed about it, and said "iniquities," they are sins of pride; "transgressions," they are rebellions; "sins," they are unintentional faults. That after confessing sins of pride and of rebellion, he should return and confess unintentional faults would be astonishing; but he said, "I have sinned, I have done iniquity, I have transgressed;" and so with David, who said, "we have sinned with our fathers, we have committed iniquity, we have done wickedly" (Ps. cvi, 6); the decision was according to the opinion of the wise men. And what was that which Moses spake (Exod. xxxiv, 7); "forgiving iniquity and transgression and sin?" Moses said thus before the holy place at the time when Israel sinned and repented, and he made their sins of pride like unintentional faults.

gave it to him who stirred it[11] (upon the fourth row of stones in the pavement[12] of the Temple) in order that it might not coagulate. He took the censer, went up to the top of the altar, turned the coals this way and that way, and took[13] from the inner consumed portions and descended and put it upon the fourth row of stones in the pavement of the court.

4. On all *other* days[14] he took *the coals* in *a censer* of silver, and emptied *them* into *one* of gold,[15] and on this day he took *them in a censer* of gold,[16] and entered with it. On all other days he took *them* in *a censer holding* four cabs, and emptied them into *one* of three cabs, and on this day he took the coals in a censer of three cabs and entered with it. Rabbi Jose said "on every *other* day he took *the coals* in *a censer* containing a seah, and emptied *them* into *one* containing three cabs, and on this day he took *them* in *a censer* containing three cabs and entered with it." On every *other* day *the censer* was heavy[17] and on this day light.[18] On every *other* day its handle was short, and on this day long.[19] On every *other* day the gold of which it was made was yellow (ירוק) and on this day red.[20] The words of Rabbi Menahem. On every *other* day a paras[21] was offered in the morning, and a paras in the evening, and on this day he added his hands full of *incense*. On every *other* day *the incense* was finely powdered, and on this day as finely as possible.[22]

[11] He blew, and shook, and mixed it in order that it might not be coagulated if he left it until he [the high priest] had performed the service of the incense.

[12] Each row of the stones of the pavement was called *robad*, רובד. And it is not possible to explain "the fourth row in the Temple" as the fourth row in the interior of the Temple (from the door of the Temple inwards), for it is written (Levit. xvi, 17) "and there shall be no man in the tabernacle of the congregation," &c. But the teaching "the fourth *robad* of the Temple" is the same as to say the fourth row in the court as one goes out of the Temple into the court. He counted the rows, and left it upon the fourth row, and there he who stirred it stood. It is not possible that those in the interior of the Temple are meant.

[13] He took the coals and left the censer until he had taken a handful of incense and put it into the *kaf* (*cf.* Levit. xvi, 12), and afterwards he took the *kaf* and the censer into the Temple.

[14] When he took coals from the second pile [on the altar, which was the pile] for the incense, to carry in to the inner altar for the morning and evening incense.

[15] They did not take them with the golden one, because taking the coals bruises the instrument and wastes it, and the law is sparing of the riches of Israel.

[16] In order that the high priest might not be fatigued by having to empty from one vessel to another.

[17] Because its sides were thick.

[18] Because its sides were thin.

[19] In order that the arm of the high priest might be helped by it.

[20] It was of that kind of gold called *zahab parvim*, זהב פרוים, because it resembled [in colour] the blood of bulls *parim*, פרים.

[21] Half a *maneh*.

[22] As it is written (Levit. xvi, 12), "and his hands full of sweet incense

5. On every *other* day the priest went up on the east of the ascent[23] *to the altar*, and went down on the west, and on this day the high priest[24] went up in the middle and down in the middle. Rabbi Judah said "the high priest always went up in the middle and went down in the middle." On every *other* day, the high priest sanctified [washed] his hands and his feet from the laver, and on this day from the golden pitcher. Rabbi Judah said "the high priest always sanctified his hands and feet from the golden pitcher."

6. On every *other* day there were four piles there,[25] and on this day five: the words of Rabbi Meyer. Rabbi Jose said "on every *other* day three,[26] and on this day four." Rabbi Judah said on every *other* day two,[27] and on this day three.

beaten small." And what does this teach us? That it is said before (Exod. xxx, 36) "and thou shalt beat some of it very small," only to tell thee that the incense of the day of atonement should be as fine as possible.

[23] As Mar said, "every turn that thou makest must be only to the right hand," which is the east (Yoma 17 b), for the ascent to the altar was on the south, and therefore they went up on the east of it, in order to turn to the right.

[24] On account of his honour, to show his dignity, that he was as a son of the house and might go in whatever place he wished, which the other priests had not the right to do.

[25] On the outer altar were four מערכות (arrangements—piles) of wood upon which they lighted the fires; one large pile, on which they offered the continual sacrifice: a second pile from which they took fire for the altar of incense; and one pile for keeping up the fire, that fire should never fail there; and one pile for the members and fat of the continual sacrifice of the evening which had not been consumed in the evening, and were not burned during the night, which they burned upon this pile. And on the day of atonement they added another pile from which to take coals for the incense before and within the vail.

[26] For three passages are written (Levit. vi, 9), "because of the burning upon the altar all night until the morning," this was the great pile: and the fire of the altar shall be burning in it:" this was the second pile for the incense; and (v, 12) "and the fire upon the altar shall be burning in it, it shall not be put out:" this was the third pile for keeping up the fire. And Rabbi Jose did not hold that there was a fourth fire for the members and fat which had not been consumed, but thought that the members and fat which had not been consumed were burned by the side of the great pile.

[27] Rabbi Jehudah did not hold that there was a third pile for keeping up the fire; and the third scripture, "and the fire shall be burning upon it, it shall not be put out," he explained to mean that he who set on fire little fragments of wood in order to light the great pile did not set fire to them upon the pavement, and go up to the altar with them burning, but lighted them upon the top of the altar. The decision was according to Rabbi Jose.

CHAPTER V.

1. They brought out[1] to him the *kaf* [spoon, A.V.] and the censer, and he took his hands full of *incense* and put it into the *kaf*. If his hand was large, the handful was large, if small, the handful was small, and thus was its measure.[2] He took the censer in his right hand,[3] and the *kaf* in his left hand, and went in the holy place[4] [היכל] until he came to *the space* between the two vails which divided between the holy place and the most holy. *The space* between them *was* a cubit. Rabbi Jose said "there was only one vail there, as is said (Exodus xxvi, 33), 'and the vail shall divide unto you between the holy *place* and the most holy.'" The outer one was hooked up[5] from the south[6] *side*, and the inner one from the north[7] *side*. He went between them until he came to the north[8] *side*, he turned his face to the south, and went to his left with the vail[9] until he came to the ark.[10] When he came to the ark he put the censer between the two staves, heaped up the incense upon the coals, and the whole house became filled with smoke. He went out in the same way and

[1] From the chamber of the vessels.

[2] As was the mode of measurement without the most holy places, so was the mode of measurement within. As without he took it by handfuls and not by a vessel, so also within, when he emptied the incense from the *kaf* into his hand, he did not empty by means of a vessel made according to the measure of his hand, but into his hand itself.

[3] Because it was heavy and hot, and the *kaf* of incense lighter than it, he took the censer in his right hand and the *kaf* in his left.

[4] He entered and went in the interior of the Temple towards the west to between the two vails. Because they doubted in the second house whether the wall which divided between the holy place and the most holy, which was in the first house and was a cubit thick, was holy, as within the veil or as without the vail, therefore they made two vails, an outer and an inner, and between them a space of a cubit to receive between them the space of the partition wall.

[5] The Rabbis who say this dispute with R. Jose about it, and say that, "and the vail shall divide unto you" refers to the tabernacle only [not to the Temple].

[6] The end was folded towards the outer side and held by a golden clasp, so as to be open on the south.

[7] He entered where it was hooked up on the south, and went between them until he came to where it was hooked up on the north.

[8] When he entered into the most holy place he turned his face towards the south, in order to go as far as the space between the staves, which was in the middle of the chamber. For the staves were long, and reached as far as the vail, one end being towards the west, and the other towards the east, and one was at the northern end of the ark, and the other at its southern end.

[9] As he was going from north to south his left side was towards the east, and the vail being on the east, his left side was "with the vail."

[10] To the place of the ark and not the ark itself, for in the second house there was no ark.

place[11] as he entered, and prayed a short prayer[12] in the outer house.[13] He did not prolong his prayer lest the people should be anxious about him.[14]

2. After the ark was removed a stone was there from the time of the former prophets, and it was called *sheteyah*,[15] foundation. It was three fingerbreadths high above the ground, and upon it he put the *censer*.

3. He took the blood from him who had been stirring it, entered to the place where he had *before* entered,[16] and stood in the place where he had *before* stood,[17] and sprinkled from it once above and seven times below. He did not intentionally sprinkle either above or below,[18] but sprinkled like a person striking.[19] And thus he counted :—one ; one and one ;[20] one and two ; one and three ; one and four ; one and five ; one and six ; one and seven. He went out and put it upon a golden stand which was in the Temple.

4. They brought to him the goat. He slaughtered it and received its blood in the sprinkling-basin. He entered to the place where he had *before* entered, and stood in the place where he had *before* stood, and sprinkled from it once above and seven times below. And he did not intentionally sprinkle either above or below, but *sprinkled* like a person striking. And thus he counted :—one ; one and one ; one and two, &c. He went out and put it upon the second stand that

[11] He did not turn his face to go out, but went out backwards with his face towards the ark.

[12] This was the prayer, "May it be Thy will, O Lord God, that if this year be hot, it may be rainy ; and let not the exercise of dominion pass from the house of Judah ; and let it not be necessary for Thy people Israel to be fed the one by the other [*i.e.*, by charity], or by another people ; and let not the prayer of travellers enter before Thee." (Gloss, because they pray that rain may not fall.)

[13] In the holy place, כיהל.

[14] Lest they should say, "he is dead."

[15] Because from it the world was founded, נשתת ; from it the Holy One, blessed be He, founded the world. שתיה, *sheteyah*, is "foundation."

[16] The holy of holies.

[17] Between the staves.

[18] That there should be one sprinkling above on the upper border of the mercy seat, and the seven below upon the body of the ark ; for the blood did not touch the mercy seat, but fell upon the ground.

[19] He sprinkled like a person inflicting blows [upon the back], who begins between the shoulders and goes downwards. Thus he endeavoured that these eight sprinklings should be upon the ground in order, one under the other.

[20] In order that he might not count the first sprinkling which was above by itself with all the seven which were below. Sometimes he might make a mistake and count the first sprinkling with the seven, and at the first sprinkling below count two. And it does not say that he should count the sprinkling which was above with the seven which were below, and reckon as far as eight. It is intended to say that the command is to finish the sprinklings which were below within seven, and not within eight.

was in the Temple. Rabbi Judah said, "there was only one stand there." He took the blood of the bullock and put the blood of the goat[21] *where it had stood*, and sprinkled from it upon the vail,[22] which was opposite to the ark on the outer side, once above and seven times below. And he did not intentionally, &c. And thus he counted, &c. He took the blood of the goat and put the blood of the bullock[23] *where it had stood*, and sprinkled from it upon the vail which was opposite to the ark on the outer side, once above and seven times below, &c. He poured the blood of the bullock into the blood of the goat, and put the full *vessel* into the empty *one*.[24]

5. He now went out to the altar which was before the Lord, that is, the golden altar, and began to purify it from above downwards.[25] From where did he begin? From the north-eastern corner, the north-western, the south-western, the south-eastern: the place where he began with a sin-offering on the outer altar was that where he finished with the inner altar. Rabbi Eliezer said, "he stood in his place and purified, and upon all *the corners* he put *the blood* from below upwards, except that one which was before him, upon which he put the blood from above downwards."

6. He sprinkled upon the clean *surface* of the altar seven times,[26] and

[21] He agrees with the words of R. Judah, who said that there was only one stand there, and it was necessary to take away the blood of the bullock first in order to put the blood of the goat upon the stand upon which the blood of the bullock had been. The decision was not according to Rabbi Judah.

[22] As it is written (Levit. xvi, 16), "and so shall he do for the tabernacle of the congregation."

[23] As it is written in reference to putting the blood upon the altar (Levit. xvi, 18), "and shall take of the blood of the bullock, and of the blood of the goat;" of the blood of both of them together.

[24] Again he poured the full sprinkling-basin into the empty one, in order that the bloods might be thoroughly mixed.

[25] This doctor thought that the priest walked to each corner in succession, and that each sprinkling was upon the corner which was before him, and near to him, and therefore took מהטא ויורד, "he purified from above downwards," to mean that he made the sprinkling from above to below; for if he should sprinkle from below upwards at the corner which was before him, the blood might flow down into the middle of his hand, and soil his clothes. And Rabbi Eliezer thought that the priest stood at one corner, and from there made the sprinklings upon all the corners; for the whole altar was only a cubit square, and since three of the corners were not near to him, he could put the blood upon them from below upwards without soiling his clothes, except that corner near which he was standing, for he could not turn the tips of his fingers downwards but upwards; for if he should turn the tips of his fingers downwards and make the sprinkling from below upwards, the blood would flow down into the sleeve of his shirt. The decision was not according to Rabbi Eliezer.

[26] After he had completed all the sprinklings of the corners, he sprinkled upon it seven times, as it is written (Levit. xvi, 19), "and he shall sprinkle of the blood upon it." טהרו, "the clean surface," was the uncovered space upon the altar,

the remainder of the blood he poured upon the western foundation of the outer altar,[27] and *the blood* of the outer altar he poured upon the southern foundation. Both[28] became mingled in the canal and went out to the Kedron valley, and were sold to the gardeners[29] for manure. And they rendered themselves guilty of false dealing in reference to it.[30]

7. All the work of the day of atonement[31] which is prescribed in order,[32] if he *wrongly* made one part to precede its fellow, it was as if he had not performed it at all [literally, as if he had done nothing]. *For example:*— if the blood of the goat preceded the blood of the bullock, he must return and sprinkle of the blood of the goat after the blood of the bullock: if the blood was poured out before he had completed the sprinklings which were within the *holy of holies* he must bring other blood and return and sprinkle afresh within the *holy of holies*, and likewise in the holy place,[33] and on the golden altar, because all the sprinklings made their own particular atonement.[34] Rabbi Eleazer and Rabbi Simeon said, "he began again from the place[35] where he had broken off."

for he turned the ashes and coals to either side, and sprinkled upon the gold of the altar.

[27] The remainder of the blood of the outer sin-offerings was poured upon the southern foundation.

[28] The outer and the inner bloods [*i.e.*, the blood sprinkled upon the outer altar, and that sprinkled upon the inner altar] which were poured upon the altar of burnt-offering flowed down and fell from the foundation [of the altar] to the pavement [of the court] and became mingled in the canal—the conduit in the court which went out to the Kedron valley.

[29] The owners of gardens.

[30] It was unlawful to make use of it before the price had been paid.

[31] All the services which he performed in the white garments in the holy of holies and in the holy place.

[32] In our mishna.

[33] וכן בהיכל. If he had made a part of the sprinklings upon the vail, and the blood was poured out, he must bring another bullock and begin again the sprinklings upon the vail, but it was not necessary to begin again within the holy of holies.

[34] Therefore the atonement that was completed was completed.

[35] And although that particular atonement was not complete, it was not necessary to return and do what he had already done. The decision was not according to Rabbi Eleazer and Rabbi Simeon.

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